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JOURNAL
CITY PLANNING DIVISION
Proceedings of the American Society of Civil Engineers

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JOURNAL
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TRENDS IN PUBLIC TRANSIT IMPROVEMENT PROGRAMS[a]

W. S. Rainville, Jr.[1]

SUMMARY

This paper describes recent trends in public transit improvement programs, classifying them into appropriate groupings and giving specific examples of each type of improvement. The efficiency of transit in the utilization of street space as a means of moving persons in congested areas is cited as a reason for its inclusion by public officials in the long-range urban transportation plan and program.

Transit improvement programs cover a wide range and variety of projects from the spectacular to the obscure, from the structural to the operational and from the physical to the psychological. The eight billion revenue passengers carried by 1,300 transit "entities" annually in some 70,000 vehicles are being handled in urbanized areas varying widely in size, population, automobile ownership and other characteristics. They are served by a variety of transit vehicles chosen in each instance with a view to their proper application to the volume of traffic to be moved, as viewed from both physical and economic standpoints.

More than 1,000 of these transit operations perform their services in communities of less than 50,000 population or in suburban areas; roughly 100 of them in areas housing from 50,000 to 100,000 persons; 80 serving the 100-250,000 population group; 40 the 250-500,000 group; and only 30 operations serving cities of a half-million population or larger.

Public transit improvements may be classified as follows:

Note: Discussion open until May 1, 1960. To extend the closing date one month, a written request must be filed with the Executive Secretary, ASCE. Paper 2272 is part of the copyrighted Journal of the City Planning Division, Proceedings of the American Society of Civil Engineers, Vol. 85, No. CP 2, December, 1959.

a. Presented at the May, 1959 ASCE Convention in Cleveland, Ohio.

1. Director of Research, American Transit Association, New York, N. Y.

1. Rapid transit improvements
2. Transit on expressways
3. Improved transit on surface streets
4. Improved traffic conditions
5. Improved vehicles and facilities
6. Improved financial stability
7. Improved public relations
8. Other improvements

Rapid Transit Improvements

Rapid transit improvements embrace new subway, elevated and surface rapid transit lines and extensions thereof, modernization of existing facilities of these types, provision of more convenient access by pedestrians and motorists, provision of complementing local and feeder services, and other items.

In addition to the major projects to be discussed by speakers from Chicago, Cleveland and Toronto, the following may be of interest.

In New York: The $58,000,000 Chrystie Street project to link the BMT with IND on the lower East side, which will add 2-1/2 miles to Manhattan's subway system when completed in 1962, and which will eliminate a major bottleneck and increase capacity of the system for rush-hour movements to and from downtown Manhattan.

The integration of the former Rockaway Division of the Long Island Railroad with the New York City rapid transit system at a cost of $54,000,000, to serve 72,000 year-round residents and a summer population of 170,000. 3,500,000 passengers were carried in 1958.

The introduction of "cycled maintenance" of tracks,and signal equipment, to be extended to cover elevators, escalators and turnstiles. This system has increased passenger comfort, reduced delays, and will effect economies in manpower and materials.

The revamping of maintenance organization and facilities to attain more efficient repair schedules, increase production, and reduce costs. This includes consolidation of two major shops; improved car cleaning-methods, machines and materials.

The purchase of new rapid transit cars and retirement of other cars to the extent of 1,410 units at a cost of $145,000,000. The new cars have dynamic braking, improved motors and controls, improved draft gear, public address systems, etc.

The substitution of diesel buses for remaining street cars and trolley coaches to gain flexibility in operating, more fluid traffic flow, and economies in maintenance costs.

In Boston: The planned $21,000,000 subway link, nearly a mile in length, paralleling the Boylston Street tube, and necessitated by the travel requirements of the projected $100,000,000 Prudential Center development.

Possible future improvements to be necessitated by the proposed Scollay Square Federal-State-City Center, which will overload existing facilities.

A future plan to replace railroad commuter service to the South Shore with rapid transit, by rail or bus, at an estimated cost of $21,000,000.

In Philadelphia: The $5,000,000 project involving three miles of track construction in the North Broad Street subway, designed to give a faster express service between North Philadelphia and downtown.

The planned future extension of the Broad Street subway and rehabilitation of passenger stations at a cost of $22,000,000, including a park-ride facilities.

In Los Angeles, the San Francisco Bay Area, South Jersey, Washington, D. C., and Baltimore - the possibilities of future rapid transit programs not yet definitely planned or approved.

Transit on Expressways

In this category are the existing and prospective railway transit operations in expressway malls, express buses in exclusive transit lanes, express buses in regular expressway lanes with provisions for passenger interchange off the expressway proper, non-stop express bus services on expressways, provision of convenient access by pedestrians and motorists, provision of complementing local and feeder services, and so on. These projects are of considerable interest to the civil engineer, and of primary importance to the taxpayer, at this time because of the Federal highway improvement program for the National System of Interstate and Defense Highways and other segments of the nation's street and highway plant. For optimum balance and best results in obtaining the most transportation per dollar invested in urban metropolitan areas, the planning approach should be comprehensive in nature–embracing all forms of transportation and the need for parking facilities, and adequate provision should be made for transit on expressways where its presence would insure that balance.

Today's prime example of rail rapid transit on expressways is the center mall operation on the Congress Street expressway in Chicago.

Current examples of express motor bus service on expressways appear in Research Report No. 28 recently issued by the Institute of Traffic and Transportation Engineering, University of California, covering operations in Atlanta, Chicago, Cleveland, Dallas, Detroit, Los Angeles, Pittsburgh, St. Louis, San Francisco and other areas.

Additional express bus operations on expressways are in effect or contemplated in Sacramento; Portland, Ore.; San Antonio; Columbus, Ohio; Richmond, Va.; San Diego and Cincinnati.

Improved Transit on Surface Streets

The improvement of transit operations on surface streets has been an almost continuous program everywhere for the last three decades. These programs were generally called "modernization" programs, and consisted largely of the substitution of modern P.C.C. street cars for the earlier models where rail operations seemed economically feasible for the life of a fleet of new cars, or the substitution of trolley coaches/ or motor buses for surface rail operations where physical and economic flexibility were required. This process of modernization was interrupted by World War II due to the shortage of equipment, tires and motor fuel, but resumed as soon thereafter as possible. Witness these comparative figures:

	1935		1957	
	Number	Per Cent	Number	Per Cent
Street Cars	40,050	62	3,601	6
Trolley Coaches	578	1	5,412	9
Motor Buses	23,800	37	50,800	85
	64,428	100	59,813	100

Modernization through vehicle substitution was accompanied by collateral advantages and improvements. The "sciences" of route cost analysis and transit vehicle selection were developed during this period. The smaller, faster vehicles gave opportunity for improved headways and faster travel time (where not offset by mounting traffic congestion). The flexibility of the automotive vehicle made possible new routes and route extensions into growing areas, with improved coverage of those areas of sufficient density to support transit services.

A recent example of such modernization was the conversion to all bus operation in the Twin Cities completed in mid-1954 at a cost of $11,000,000 for 525 new diesel buses. Economy in operations and flexibility in fitting in with governmental plans for the area resulted. In Birmingham a $2,400,000 project involving the purchase of 100 new buses has permitted a program of improvements in routing, speed and service extensions with direct downtown access. In Buffalo, downtown routings have been improved, and services have been extended to new housing areas and shopping centers. Sacramento has purchased new buses, increased route coverage of services by 15 per cent, and added new routes. Portland, Ore. has established through routes, eliminated many transfers, and reduced the number of vehicles on downtown streets without reducing the level of service. San Francisco has introduced 380 new buses. Columbus, Ohio, has re-vamped routings and extended a number of lines, along with its program of new equipment purchases. Richmond, Va. has improved headways and established new routes and extensions to shopping centers and housing developments. Dayton has raised system speeds substantially.

Within the past decade, and particularly the last half thereof, transit operators have brought forth many innovations and improvements in surface operations. Some of these are: express/limited/local services on arterial streets in various combinations; park-ride services; courtesy parking services; stop and shop plan; ride and shop services (including transit validation plans similar to "park and shop"); club bus services; baby stroller

service; special shoppers services (including expresses); services to special events; direct routes to industrial, commercial or shopping centers, and so on.

Examples of these surface transit improvements may be found in many cities. Cincinnati, Los Angeles and Nashville use the "club buses." St. Louis and Baltimore provide examples of comprehensive innovations in surface bus operation designed to enhance the speed and convenience of service to the transit rider. Birmingham, Baltimore and Cincinnati have been eliminating feeder services in favor of direct services from residential areas to the central business district. Dallas in its changeover to buses, has done a major rerouting job to conform to the pattern of street improvements, including extensions. Nashville has provided bus shelters in the central transfer area. Toledo has simplified downtown operations with a unique "neutral fare zone." San Diego, Toledo, Richmond and Sacramento have increased their charter and special bus services substantially.

Improved Traffic Conditions

Many of transit's efforts to improve the speed and convenience of its surface operations have been nullified in part through the congestion arising from increased ownership and utilization of the private passenger automobile.

In many cases, necessity has brought about the cooperation of police, traffic and transit officials in attacking the problems of traffic congestion, and in some notable instances improvement has resulted. Operators have simplified their downtown routings, and sought to reduce the number of transit stops. Traffic officials have prohibited parking, standing or stopping on transit thoroughfares during peak hours in prevailing directions and provided stricter regulation of commercial vehicle loading. Police have enforced traffic and parking regulations more rigidly. Bus stops have been lengthened and better marked. Traffic signal timing has been improved on transit streets. Lanes have been reserved exclusively for the use of transit vehicles at certain times of day on important arteries with interesting results of benefit to the transit rider and the motoring public.

In several places where, emulating the pioneer example of Nashville, the exclusive transit lane has been tested, there has followed an extension of the program, either as a greater length of the initial street as in Rochester, or on additional traffic arteries as in Baltimore. Some of the cities experimenting with this have carefully measured the speeds of movement of transit vehicles and general traffic BEFORE the change, and then repeated these test procedures AFTER the change to ascertain the improvement.

In Baltimore, for instance, buses were speeded up on the average about 20 per cent; other traffic was speeded up by as much as 30 per cent. In Atlanta, reported results were much more startling at certain times of day. In Birmingham, an improvement of 20 per cent in vehicle speed has been obtained in the afternoon rush hour. In Dallas, bus speeds have increased up to 26 per cent, with corresponding improvement in the speed of general traffic.

Improved Vehicles and Facilities

Improvements to rapid transit cars and their equipment are constantly being made as the result of both the individual and the combined efforts of the operators, in cooperation with manufacturers and suppliers.

The medium for the exchange of ideas and experience in this field among the companies is the Advisory Committee on Rail Cars of the American Transit Association, which works cooperatively with Transit Research Corporation. The latter organization is currently engaged in the research, design and development of trucks for high-speed rapid transit cars of various types. Several manufacturers of trucks, motors, controls, brakes and other components are participating with the operators in these efforts.

In the motor bus field research and development have been continuing programs with the manufacturers of vehicles and their components. Their efforts have been spurred by two committees of the American Transit Association–a greater rider appeal through improved seating, flooring, lighting, color, front-end visibility, picture windows, wider aisles, extra leg room, lower steps, etc., and the Advisory Committee on Motor Buses, which maintains a set of periodically-revised "Urban Motor Bus Design Objectives" for the guidance of the manufacturers. These objectives cover every aspect of the vehicle from roof to tire tread.

Companies have generally kept abreast of the times, unless financially handicapped, in improving their fleets through periodic purchases of these newer vehicles and components.

In the rapid transit field, in addition to the cities represented on this panel, New York, Boston and, shortly, Philadelphia, have been or will be in the market for new rail cars. The numbers of operators purchasing modern motor buses are too great to mention.

Air conditioning has been installed on buses in several cities, including San Antonio, Dallas, Washington, Annapolis and St. Louis. Units have been developed by vehicle manufacturers for installation on new buses, and by other manufacturers for installation in transit shops on vehicles already in service. Experimentation with this form of improvement in passenger comfort continues, including preliminary tests of its possible application in subway cars.

Many companies have installed short-wave radio communication systems giving two-way flow between the central dispatcher and mobile supervisory units, trouble trucks, and company official cars. Some companies have installed two-way radios in their individual buses, providing for constant communication between transit dispatchers and bus drivers. Problems can be handled immediately; service interruptions are minimized and more promptly corrected; schedule adherence becomes easier; information may be quickly obtained for passengers. Lost articles and lost children may be readily accounted for. Late night connections at transfer points can be assured. Supervisory and other costs have been reduced, and public convenience has been enhanced.

Behind the scenes, and quite apart from public observation or consciousness, are the facilities for maintaining the vehicular fleet and other property. Companies large and small are engaged in continuing programs of improvement to maintenance plant and equipment, and in increasing the effectiveness of their maintenance programs. Recent expenditures of some magnitude have

been made in Buffalo, the Twin Cities, Birmingham, Baltimore, Sacramento, Toledo and Springfield, Mass.

Improved Financial Stability

The transit industry has waged a continuous and rather successful battle against the adversities which have beset it in recent years. Caught in a spiral of high capital and material costs and increasing labor charges, the companies have been forced to raise fares not once but several times since V-J day. This has discouraged riders--but not at rates of passenger loss which have been characteristic of fare increases in less prosperous times. The price of the transit ride has been rising along with rises in the prices of bread, milk and other household and family necessities. So have the salaries and wages of transit riders.

Every effort has been made to improve operating efficiency and to render as much service as possible per dollar of operating revenue. Despite these measures, the ratio of operating income to operating revenue for the industry as a whole has dropped to less than 3 per cent as contrasted with nearly 15 per cent 30 years ago. Between 1940 and 1957 operating revenues rose 88 per cent, while operating expenses, including depreciation, increased 111 per cent. . . . . .1957's industry earnings amounted to roughly but 1 per cent on its investment--a showing hardly conducive of attracting new capital for improvements.

The transit industry has been active in seeking relief from burdensome taxes and special imposts, some of which are relics of the day when it was a monopolistic and lucrative business. This program began in earnest some years ago when, in the first year, relief was granted in three instances. In the 12-1/2 years to mid-1959, nearly 250 cases of tax relief have been reported, covering franchise and gross receipts taxes, license and registration fees, motor fuel taxes, occupational and real estate taxes, etc. Bills have recently been introduced in several state legislatures aimed at sustaining present, or granting additional, relief.

There are many publicly-owned transit operations in the United States, including those serving New York, Chicago, Los Angeles, Detroit, Boston, Cleveland, San Francisco and Seattle. The trend towards outright public ownership has been steady, but not accelerating. Many such proposals are made, but relatively few are put into effect in any calendar year. . . .It has been discovered, I think, that public ownership per se possesses no special magic, and is not necessarily the ultimate solution to the financial and operating headaches which plague the industry. Opportunity to observe this may be found in an intensive comparative study of the legislation creating the four so-called transit "authorities" at New York, Chicago, Los Angeles and Boston. The legislative experts, in making provisions to guide the authority board members, showed that they expected them still to be confronted with such problems as declining riding, payment of certain taxes, the requirement of operating on a self-sustaining basis, necessity for further fare increases, and labor relations, including negotiation and arbitration of differences and disputes.

In at least six recent instances the city "take-over" of transit facilities has been under a leasing arrangement, in which the former "private management continues to operate the system for a fee. Such arrangements are

intended to result in savings in Federal excise taxes and, possibly, some state, county and municipal taxes. A recent court decision in Michigan upholds the legality of this expectation as it applies to state motor fuel levies and weight taxes. Two of these lease-and-rental agreements in the far West have not worked out satisfactorily from a financial point of view, and recent attempts to secure voter approval of a subsidy arrangement to assure continuation of these systems was defeated.

The use of a public subsidy for private transit operations appears to be more prevalent in Canada than in the United States at the present time. Of the two or three cases in this country, one is functioning quietly and smoothly, and apparently to the satisfaction of the city and the transit operator. In another case, perhaps the subsidy came too late. In fact, consideration for the transit system came too late–after the city had engaged in an extensive program of public off-street parking in the downtown area which sapped the transit system of its financial vitality. The attitude of some private transit operators towards the acceptance of public subsidies has changed to this extent–they are now more willing to consider subsidization of those non-compensatory services which are insisted upon by the regulatory authority or the riding public.

The economic and financial health of transit operations–public or private–is a matter of grave concern to the urban community, and should be looked into early and often. Constructive steps should be taken to insure the continuing solvency of the enterprise. Otherwise, by the time the master plan has been devised embracing the "optimum balance" of improved streets and highways, improved parking facilities and improved transit, the transit operation may have "disappeared from the scene."

Improved Public Relations

The transit industry and its components have engaged for years in efforts to improve its relations with the general, the riding, and the motoring public. Such activities cover a wide range. Some are devoted to making it easier for the public to use transit–information as to routing, schedules, travel times, locations of stops, etc. Others are devoted to educating the public transit-wise, including efforts to emphasize to transit personnel their personal interest in better relations with the public. Finally, there has been great stress in recent years on awakening the consciousness and the interest of other groups in the urban metropolitan area as to their "stake" in the total transportation problem and transit's place therein. Interestingly enough, earlier efforts in this direction were promoted by transit. Today, transit has difficulty keeping up with the requests it receives to bring the story toretail merchant groups, planning groups, advanced traffic engineering students and others who are trying to determine, from the standpoints of their special interests, where transit services fit into the total picture of urban transportation improvements.

In its public relations work, transit uses every modern medium–radio, television, newspaper space, direct mail material, interior and exterior car cards, system maps, individual route maps and schedules, timetables posted at bus stops, the Welcome Wagon service, etc. In San Diego, customer relations round-table discussions for drivers are held regularly. One operator says "the best approach is through better service, improved employee relations, and a 'fair' local press."

Other Improvements

Many companies feel that the improved records in safety and accident prevention which they have achieved are worthy of inclusion in this discussion. Most transit companies take great interest in, and participate in, the safety programs of the American Transit Association, and the National Safety Council. Great studies have been made in an industry already distinguished for its safe operations.

CONCLUSION

Transit improvement programs having broad community impact cannot be satisfactorily developed in a vacuum, or out of context with programs for improvement of urban transportation generally. In any urban area policies, plans and programs for such improvements should be considered "in the large"—embracing streets and highways and off-street parking as well as transit.

Transit is an efficient means of moving persons in urban areas—the most efficient in terms of use of street space per person moved. It requires no parking space, which is a boon in congested areas. Thus, it merits consideration and a place in future city and urban transportation planning. The need for its inclusion should be thoroughly explained to the public officials. Transit improvement plans need to be clearly and publicly developed in studies of alternative solutions of the community's problem, so that an informed public may make its decisions wisely, leading to achieving the "optimum balance" in the total improvement program and giving the taxpayer the most transportation for his money.

One medium for accomplishing such comprehensive advance planning is the program of the National Committee on Urban Transportation, which has produced the guide manual—"Better Transportation for Your City" and a series of procedural manuals. These latter documents include one on "Standards, Warrants and Objectives for Transit Services and Facilities," one on "Measurement of Transit Services," and one covering "Standards for Street Facilities and Services." These aids may be obtained from Public Administration Service, Chicago, Ill., for a nominal cost. Those cities and transit companies which have participated in advance planning "pilot" projects under the NCUT program are convinced that there will be greater reliance on public transit in the future in many urban areas.

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SAN DIEGO TRANSPORTATION PLANNING STUDIES[a]

Edward M. Hall,[1] M. ASCE

SYNOPSIS

San Diego has established a continuing urban transportation planning program. The concepts and administrative organization of this metropolitan area transportation study are described. Selected examples demonstrate the wide range of factual approaches to a coordinated solution of transportation problems. The importance of all levels of government and agencies concerned working together is emphasized.

INTRODUCTION

Who is responsible for transportation planning in metropolitan areas? The State—the County—the region or metropolitan area—the City? What department of the City is responsible for urban transportation planning? Planning—Engineering—Public Works—Management—Police Traffic? The answer is simple and clear. All levels of government and all departments and agencies concerned must do the job together.

Recently the AMA-AASHO Joint Committee on Highways and the Urban Research Committee of the Highway Research Board in cooperation with Syracuse University sponsored a National Conference on Highways and Urban Development. The Sagamore Conference emphasized cooperation and coordination of the urban transportation challenge and did much to define the areas of responsibilities for action.

Note: Discussion open until May 1, 1960. To extend the closing date one month, a written request must be filed with the Executive Secretary, ASCE. Paper 2306 is part of the copyrighted Journal of the City Planning Division, Proceedings of the American Society of Civil Engineers, Vol. 85, No. CP 2, December, 1959.

a. Presented at the February 1959 ASCE Convention in Los Angeles, Calif.

1. Transportation Research Director, City of San Diego, Calif.

San Diego Program

In 1954 the City of San Diego reached a decision to implement a program for the orderly accumulation of facts, and to coordinate the application of these facts toward the solution of growing urban transportation problems. Following several meetings with political and public support leaders in the metropolitan area which indicated widespread approval for an urban transportation program, a series of conferences was held to develop a technical approach to the program. Representatives of the Automotive Safety Foundation, the Bureau of Public Roads, the California Division of Highways, the Automobile Club of Southern California, and the Institute of Transportation and Traffic Engineering of the University of California conferred during a two-day period and put together the basic ideas and objectives of the San Diego Transportation Studies.

These guiding principles are:

1. Urban transportation planning must be a continuing function of government rather than a one-shot approach.
2. Transportation problems of a metropolitan region have no jurisdictional boundaries, therefore any study must include the entire San Diego metropolitan area and all jurisdictions or agencies concerned with transportation.
3. The study must concern itself with all types of transportation utilizing streets and highways, transit, the terminal requirements, and with related functions such as administration, laws and financing.
4. And perhaps most important, a small nucleus coordinating staff should be created to work with and through the existing departments. Included in this concept was the thought that existing departments should be augmented to carry out such additional studies as might be required during the transportation study and that the basic responsibilities of the department must be maintained and their knowledge and experience utilized.

Organization

The Problem

The basic guiding principles presented a challenging problem in administrative organization. It was felt that if the technical people of the City could be brought together, the sincere differences that might occur between departments would be resolved.

The lack of a formal metropolitan or regional government presented another challenge. How can seven individual cities, the County, the State Division of Highways, a private transit system, and the U. S. Navy be formed into a technical working team? San Diego's answer is as follows.

History

On March 1, 1955 the Office of Transportation Research was established within the Department of Administrative Management as a part of the City Manager's staff. Transportation Research Staff now consists of a Director, a staff engineer, a staff planner, a draftsman, and a secretary.

Advance Transportation Planning Team

Shortly after the formation of the Office of Transportation Research the idea of a new type of administrative organization was conceived. This idea has resulted in one of our most interesting accomplishments—the organization of an Advance Transportation Planning Team for the San Diego Metropolitan Area. This team is composed of five people representing the City Planning Department, the City Highway Design Engineer, the City Traffic Engineer, County Planning Department, and the County Surveyor and Road Commissioner. These five technicians work together as a full time team in one office separate from day-to-day operations. The members of the team work under the guiding supervision of the Transportation Research Director, but report directly to the department heads of the City and County whom they represent. In this manner they act as liaison officer to the department heads keeping them informed of what is going on in the Advance Transportation Planning Team and in Transportation Research, and bringing to the Team and to Transportation Research the data, knowledge, and day-to-day activities of their respective departments. This procedure has the additional important advantage of maintaining the proper balance between operational problems and long-range thinking. Its function is to serve as a two-way street of communications.

Through the Advance Transportation Planning Team three elements of transportation planning are brought together with an appreciation of each other's concepts and problems. As the City Team reaches a recommendation concerning a study or special assignment, it is presented to a meeting of the City department heads. The department head has then an opportunity to present his ideas through his representative and then has the further opportunity to discuss the problem with other department heads concerned. We have found that the joint conclusions of the competent technicians working together on the Team are impressive.

Technical Coordinating Committee

From its inception the San Diego Transportation Study has been based on the premise that transportation is a metropolitan area problem and must be studied as such. To coordinate this metropolitan area study a Technical Coordinating Committee has been organized and is composed of the Planning Directors, City Engineers and Traffic Engineers of the seven cities, the County, and the California Division of Highways working together on an informal basis. Representatives of the San Diego Transit System, Navy, Traffic Division of the San Diego Police Department, and the Industrial Coordinator and Urban Renewal Coordinator are also members of the Committee. This group has met once a month since May 1955 to review the progress of the Study and to discuss general policy in an advisory capacity. The Technical Coordinating Committee has substantially eliminated, at the technical level, the problems that often occur between a large central city and the small individual communities nearby. A common understanding and a spirit of cooperation has prevailed within this committee from its beginning.

Executive Committee

As our transportation study has shifted from its initial fact-gathering phases to the application phases, it has become increasingly necessary to

have a small steering and implementing group. The Executive Committee was formed a little over a year ago and consists of the Assistant City Manager as Chairman, the Director of Public Works-Water-Utilities and Engineering, the City Engineer, the City Planning Director, and the Transportation Research Director who serves as Secretary. This five man Executive Committee has provided the means for implementing the results of several urban transportation planning studies. Further, it furnishes a means for focusing attention on certain administrative problems and thereby finding early solutions to such problems.

This Committee is organized on an informal basis. The District Engineer of the California Division of Highways, or the County Engineer, or the County Planner, or Transit System official can be invited to attend at such times as it is important to have their counsel on the Committee.

Pilot City Program

During the same period that the San Diego Metropolitan Area Transportation Study was developing, the National Committee on Urban Transportation was formed, prepared procedural manuals to establish the uniform urban transportation fact gathering procedures, and selected pilot cities to field test the methods and procedures. San Diego was selected as one of the Pilot Cities in March 1956 and has undertaken to field test all the nine areas of the National Committee draft manual. A little over a year ago San Diego submitted an extensive report on our work during the Pilot City program to the National Committee.

A great deal has been learned in the process of field testing these manuals. Because San Diego had a year's head start in getting our local organization underway, we were able to make many contributions in the preparation of these manuals through the process of reviewing the results of the practical application. San Diego has materially benefited from the program by amassing a large amount of factual data, using this data in day-to-day operations, and most important, applying the data, techniques and concepts that have been developed to long range urban transportation planning.

The National Committee on Urban Transportation has published a Guide Manual entitled, Better Transportation For Your City. This outstanding publication along with the series of procedural manuals presents the efforts of 175 leading people and is designed to help cities and metropolitan areas in the solution of urban transportation problems. If our experience is typical, the guide and the manuals will be extremely useful to cities in all population groups attempting to solve their transportation problems and to coordinate transportation planning activities with other jurisdictions and agencies.

Selected Examples of Transportation Planning

The functioning of the administrative organization for a program of urban transportation planning is illustrated by briefly describing five selected examples that involve the application of the factual approach to the coordinated solution of transportation problems in a metropolitan area.

FIGURE 1

SAN DIEGO METROPOLITAN AREA TRANSPORTATION STUDY

TRAVEL TIME STUDY - 1957

Travel Time and Level of Service

The quality of urban traffic service may well be measured by three criteria: first, travel time in terms of a delay rate; second, safety in terms of an accident rate; and thirdly, economics—the cost and benefit of any given level of service. This latter may well be expanded to include the economic relationships between transportation and the total economic balance of a region.

Travel time studies have been completed on 346 miles of urban streets and highways. Figure 1 shows 273 miles of freeway, major, collector and local streets studied during 1957. The San Diego Transit System has participated by conducting Transit Travel Time Studies on a number of routes.

These travel time studies have been related to the functional concept of street classification. This concept holds that a street system has two basic purposes which are diametrically opposed. These basic purposes are to move traffic and to provide access to abutting property. Our travel time studies have developed levels of service in terms of speeds which are practical of attainment on the various geometric designs related to the different functional classifications of streets and highways. Table 1 shows the level of service our studies have developed for the various functional street classifications in terms of average overall speed.

The travel time studies enable us to present a simple measure of the existing level of street and highway transportation service. Figure 2 shows

TABLE 1

TRAFFIC ASSIGNMENT OVERALL SPEEDS

Classification	Overall Speed MPH Urban	Rural
Freeway [a]	50	55
Expressway [b]	35	50
Major Highway	--	50
Major Street -		
Normal	30	--
Highly developed area	20	--
Feeder	25	40
Local	15	--
Business Street (C.B.D.)	15	--

a Freeway -- Full control of access and complete separation of grades.

b Expressway -- Full control of access and some or all intersections at grade.

the existing level of service in San Diego in terms of equal time contours radiating out from the Civic Center. This analysis clearly demonstrates that present traffic facilities enable the motorist to travel six miles farther in a north-south direction than in an east-west direction in 25 minutes.

The level of service concept also provides a tool to evaluate our future freeway system plan. Figure 3 portrays the level of service that our planned freeway system would provide for the "horizon year" in terms of the population included within radii enclosing one million and two million people. The estimates of the City and County Planning Departments forecast a horizon year population of 2.5 million for the metropolitan area. This assumes present concepts of development will continue. This evaluation concept was developed based on the idea of the historical 30 minute city—travel time from home to work 30 minutes or less.

FIGURE 2

SAN DIEGO METROPOLITAN AREA TRANSPORTATION STUDY TRAVEL TIME STUDY – 1957

Highway Needs

The 1971 Highway Needs Study presented an ideal project to be undertaken by the metropolitan area Technical Coordinating Committee. Representatives of the Bureau of Public Roads and the Division of Highways at the State level came to a meeting of the Technical Coordinating Committee to present the requirements of the 1971 Highway Needs Study.

The Committee undertook this study and, using uniform design standards, developed together a Freeway and Major Street System. The system was based on the land use and population estimates developed by the several planning agencies and the traffic estimates resulting from these planning concepts. The street, highway, and freeway study system for the 500 square mile metropolitan area was in turn coordinated with the Highway Needs Study of the County of San Diego through the County representative on the Advance

FIGURE 3

SAN DIEGO METROPOLITAN AREA TRANSPORTATION STUDY TRAVEL TIME STUDY - 1957

Transportation Planning Team. Perhaps the degree of coordination achieved in the 1971 Highway Needs Study can best be demonstrated by the fact that the seven cities, the County, and the Division of Highways all submitted the same identical system map for the San Diego metropolitan area.

Freeway System

The 1971 Highway Needs Study very naturally led into necessary studies for one of the outstanding pieces of highway legislation in California in recent years. Senate Concurrent Resolution No. 26 adopted by the 1957 legislature required a state-wide study of the ultimate freeway and expressway system for the State of California and for the connections thereto, irrespective of jurisdictions. Again, the Technical Coordinating Committee served to bring together the knowledge, data and concepts of the several jurisdictions in the technical fields concerned in such an important long range study.

The City and County planners developed an estimate of future land use for the entire metropolitan area based on land use surveys and analysis of the holding capacity of the land. Planners further developed population estimates for the horizon year as well as for intervening target years.

City Traffic Engineering and Transportation Research developed studies of the traffic generation and attraction of various land uses. These studies were based on:

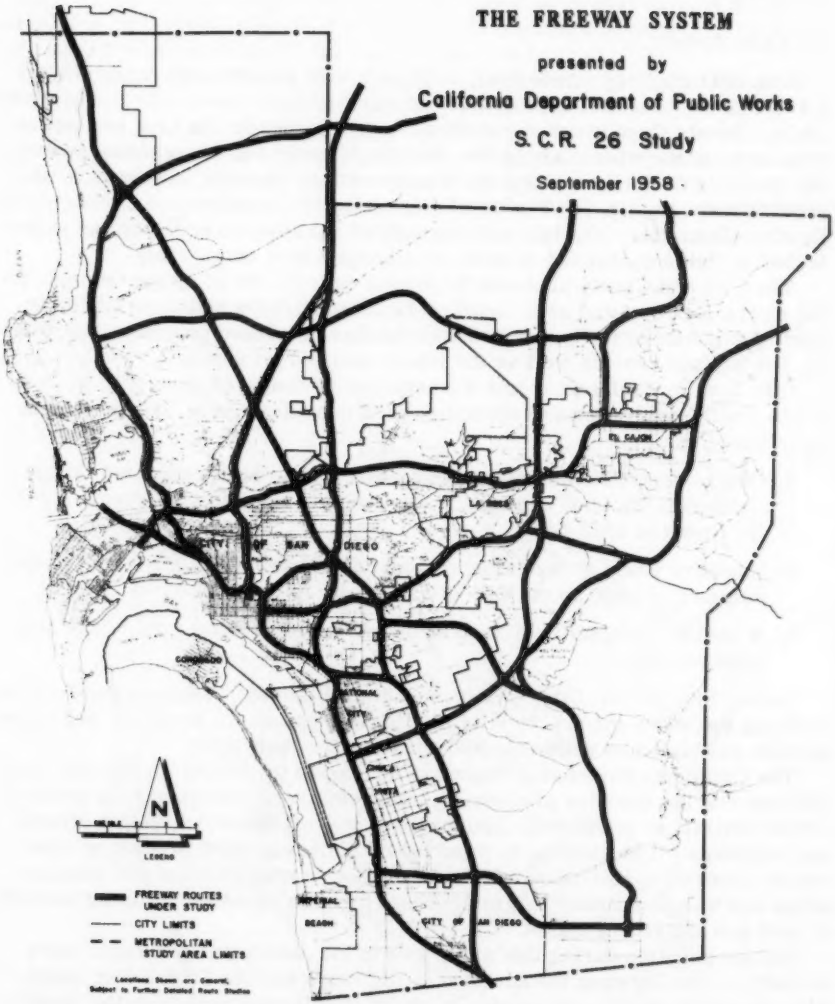
1. Origin-destination studies of the metropolitan area conducted by the California Division of Highways in cooperation with the Bureau of Public Roads in 1952-53.
2. Intensive study of two large residential sub-divisions made during the summer of 1956 by the City of San Diego.
3. A number of specific studies of industrial and commercial areas and communities.

During this period, City, County, and State Highway design engineers were studying the costs and practicality of alternate routes for freeways and major streets and highways within the 500 square mile study area.

The California Division of Highways developed the traffic assignment procedures and the machine processing, using electronic computers, to produce traffic estimates on the study plan of freeways-expressways, major streets and highways. It is exciting to report that this assignment procedure used traffic generation estimates based on land use characteristics and relationships and was distributed by gravitational formula based on the interrelation of land use and travel habits.

The cooperation during this study was to the extent that personnel were actually traded between the Division of Highways and the City of San Diego when different skills were needed to assist in different phases of the operations. There were constant meetings and a division of work assignments between the major jurisdictions—State, County, and City of San Diego.

As you know, a State-wide system of freeways has been developed by the Department of Public Works of the State of California for submission to the State Legislature. In San Diego, the traffic assignment was used to evaluate the study plan. Based on the traffic assignments to the initial study plan, a slightly modified study plan was developed for SCR 26. The SCR 26 freeway system is shown in Figure 4.



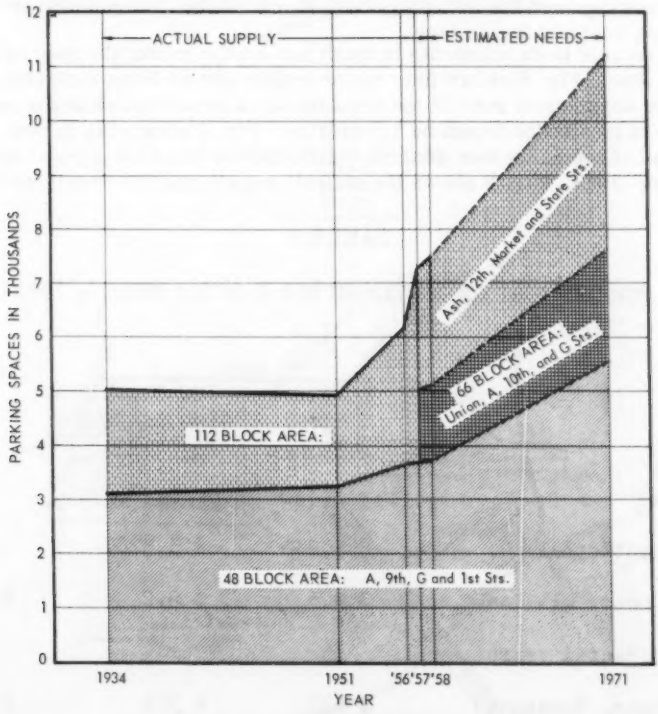
SAN DIEGO METROPOLITAN AREA TRANSPORTATION STUDY FIGURE 4

We are now engaged upon the assignment of traffic to the SCR 26 Freeway System for the horizon year—that year when the population of the San Diego metropolitan area will equal 2.5 million, and for the year when the population will equal 2.0 million. Further, we are developing the basic data for traffic assignment for the years when the population will equal 1.5 and 1.0 million people. This will facilitate the development of both a plan and program for the staging of a completely integrated and properly balanced freeway system.

Parking Needs

In an effort to develop an estimate of the parking needs to correspond to the 1971 Highway Needs Study, our parking requirements were projected to 1971. Study of usage, duration, and occupancy—both street and off-street were made. These studies were basically sampling studies to determine overall planning data for the central district of the City of San Diego.

Figure 5 shows the historical parking supply data. Further, Figure 5 visually presents a summary of the estimated parking needs of 1971 for the various areas of the central city. The parking needs cost estimates are summarized in Table 2. It would appear that the parking needs for the central district of San Diego can be provided at an average expenditure of approximately $1,000,000 a year over the 15 year period.



OFF-STREET TRENDS AND PROJECTED NEEDS

1934 to 1971

FIGURE 5

SAN DIEGO METROPOLITAN AREA TRANSPORTATION STUDY ESTIMATE OF PARKING NEEDS – 1971

Encanto Study

In addition to the overall planning studies the factual approach has also been applied to specific major street and specific freeway location studies. A recent example concerned the area of Encanto in San Diego. The problem was to determine which of two principal freeway locations would best serve present and future estimated traffic and have the least adverse effect on developed and developing property.

Studies were made of present development and the subdivision activities during the past several years. Additional subdivisions in the near future were indicated by tentative subdivision maps on file. Further studies included the holding capacity of the land and location of existing and proposed school and park sites. Based upon these studies planning forecasts and estimates of traffic generation were made. The generated traffic was then distributed over the various alternate systems. These studies were made for the horizon year. Then, through a new development in the use of factors which are "growth fractions" of the horizon year, we made estimates for the traffic that would be expected for various target populations of the metropolitan area. The growth fraction technique enables us to first determine the horizon year traffic estimates and then to back down the interzonal transfers by using parameters such as population and land use. For the traffic experts it is emphasized that this technique eliminates the serious problems of the zero interchange and the infinite growth factor which have plagued traffic forecasting analysis for so long.

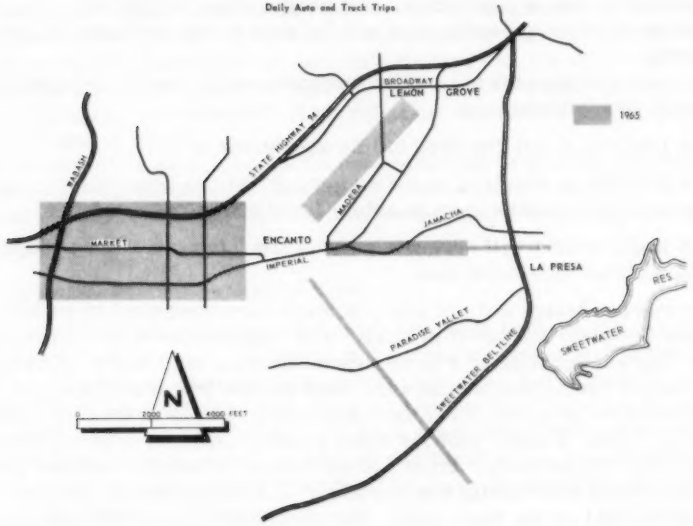
We were able to demonstrate through our traffic model the reorientation of traffic flow. Fig. 6 shows four major traffic desire lines radiating from one traffic assignment zone in the Encanto Area for 1965—when the metropolitan area population would be 1.0 million. Fig. 7 shows the growth and orientation of the same four general traffic desire lines for a population of 1.5 million—1980. Fig. 8 shows the overall growth and the reorientation at

TABLE 2

SUMMARY COST OF PROVIDING FOR PARKING NEEDS - 1971

Item	Area		Total
	66 Block Central Core	108 Block Central District	
Spaces	2,430	1,480	3,910
Unit cost/stall	$ 3,840	$ 3,520	--
Total cost, millions	$ 9.3	$ 5.2	$ 14.5
No. projected years	15	14	--
Cost/year, thousands	$ 622	$ 372	$ 994

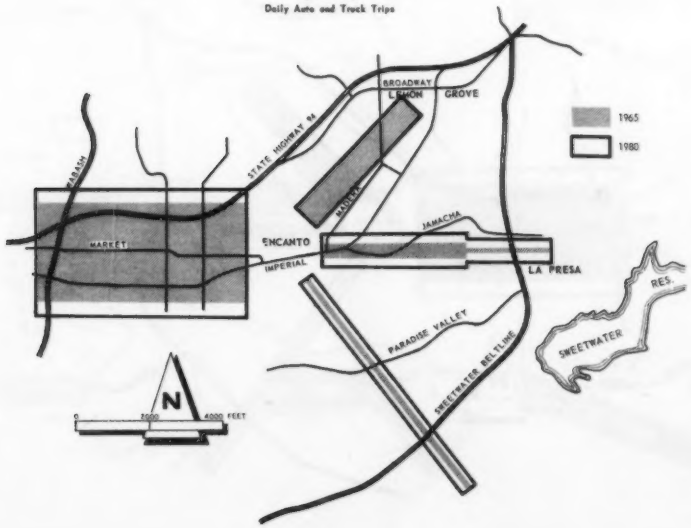
FOUR MAJOR TRAVEL DESIRE LINES
FROM
ENCANTO
(ZONE 64)
Daily Auto and Truck Trips



SAN DIEGO METROPOLITAN AREA TRANSPORTATION STUDY

FIGURE 6
ENCANTO STUDY

FOUR MAJOR TRAVEL DESIRE LINES
FROM
ENCANTO
(ZONE 64)
Daily Auto and Truck Trips



SAN DIEGO METROPOLITAN AREA TRANSPORTATION STUDY

FIGURE 7
ENCANTO STUDY

the horizon year. We felt that this mathematical model of traffic orientation or distribution was quite logical when it was borne in mind that the area to the southeast is today completely undeveloped, but in the horizon year would be expected to have a population in the neighborhood of 200,000. The area to the east is developing rapidly now and the area to the northeast is largely developed.

Figure 9 summarizes the traffic forecasts which clearly indicate several important conclusions:

1. A freeway is not required in this area prior to 1965.
2. A freeway is required in the vicinity of 1980 or when the metropolitan population reaches approximately 1,500,000.
3. A major street will adequately serve the interim and long range needs in a direct east-west line.

Engineering design and economic studies were conducted to enable us to calculate the costs and benefits likely to be expected from the principal alternate freeway locations. Fig. 10 demonstrates a method for calculating the economic breakpoint and thus the most economical traffic service location. Line A plots the per cent (50%) the minor movement is of the total traffic in line 1965. Lines B and C plot the same relation (32% and 17%) for 1980 and horizon year respectively. Point I is the time and distance balance point between the travel time savings of the minor movement and the adverse distance introduced on the Main Line. The conclusion is reached that the location should serve the horizon year major movement if constructed any time

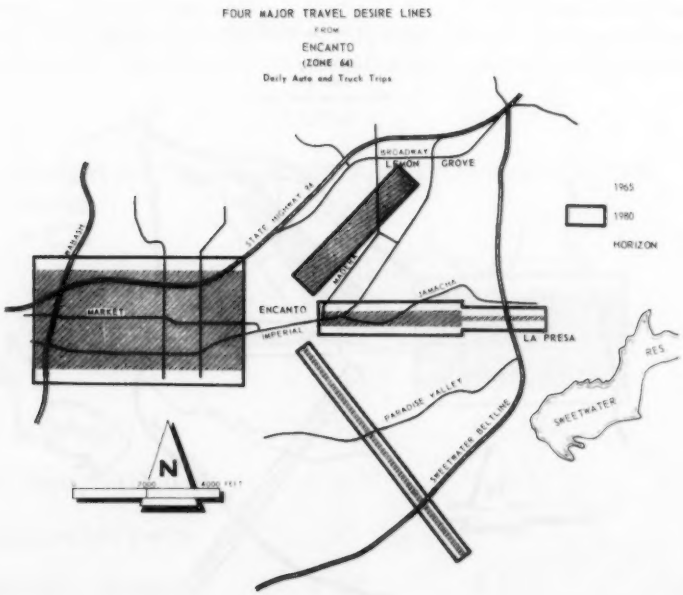


FIGURE 8
ENCANTO STUDY

after 1970, since a 20-year amortization period is used. From this and the traffic data we were able conclusively to determine that a freeway was not needed in the Encanto area today, would not be needed until nearly 1980, and when needed would most economically be located on the southerly location.

In addition to the answers furnished by the planning data, traffic forecasts, design and economic studies we developed a guiding tool for estimating how far in advance it was economically justifiable to acquire rights-of-way. Although preliminary, this economic slide rule type device has clearly indicated generalized answers.

These studies thus demonstrated factually the type of facility required, the best location for the freeway, the necessary level of traffic service, the most economical service to traffic, and the minimum adverse effect on land and its development.

Planning A Balanced Transportation System

We have briefly outlined selected studies that have been completed in the San Diego metropolitan area. In addition, a large number of fact gathering projects have been implemented on a continuing basis. Large quantities of factual data have been obtained and analyzed and are being applied in our urban transportation planning studies. We have a soundly developed freeway system which is currently being refined by additional study and analysis. It is felt that we have an adequate estimate of the parking needs for the central district of the City of San Diego.

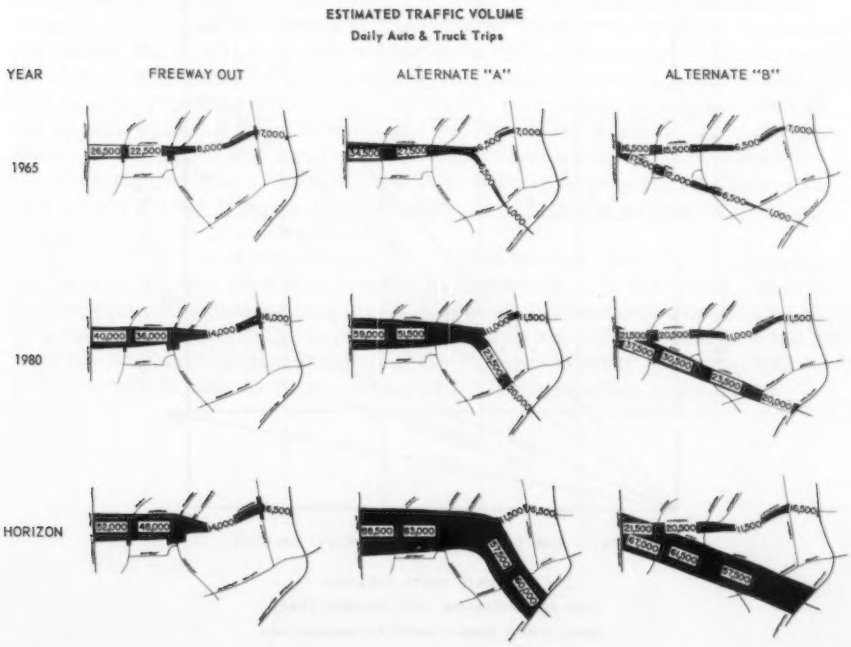


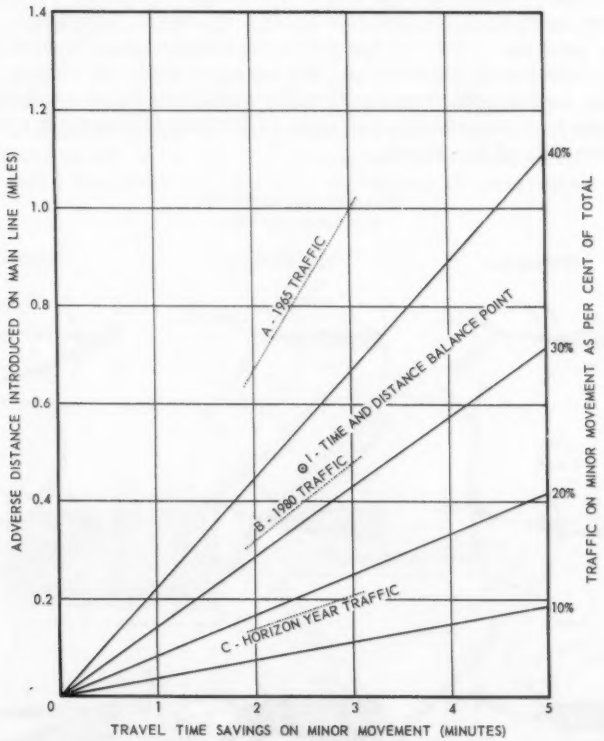
FIGURE 9

SAN DIEGO METROPOLITAN AREA TRANSPORTATION STUDY

ENCANTO STUDY

However, it is emphasized that we are striving to be able to integrate and balance the total land transportation system of highways, major streets, terminal facilities of all kinds, transit and trucking. A balanced transportation system will undoubtedly have varying degrees of use of travel modes in different areas throughout the metropolitan region. For example, in the downtown area we can expect high per cent of transit use, whereas the outlying areas in the horizontally developed region such as San Diego a minimum transit use can be expected. This does not mean that transit is unimportant or should be excluded from our planning. In fact, the converse is surely true. For instance in San Diego, 35% of our peak hour people entering and leaving the central district are moved by transit. Think if you will for just a moment what this would mean if we had to move an additional 10,000 people in approximately 6,700 cars on the existing street and freeway system in the peak hour.

We are searching for a means of studying the economic balance of the total transportation system in relation to the level of service in terms of



ALTERNATE ROUTE LOCATION
TIME AND OPERATING COST BALANCE CHART
Savings to Minor Movement Cancelled by Increased Costs To Main Line Traffic

FIGURE 10

SAN DIEGO METROPOLITAN AREA TRANSPORTATION STUDY ENCANTO STUDY

travel time and safety. We are hopeful that during the next year inroads can be made into this challenging problem of evaluating the balanced transportation system.

The importance of achieving a balanced transportation system is emphasized by the very large sums of money being invested in our urban areas and particularly in our metropolitan regions. In San Diego it has been estimated that to provide adequate street and highway transportation service by 1971 will require a total investment of public and private funds of 1.8 billion dollars. In addition to that we have estimated that the private vehicle terminal facilities of the downtown area of San Diego will require the investment of another 15 million dollars. There is a real need to study these costs in relation to the cost of providing convenient and efficient transit, and in relation to the theoretical efficiency of transit and to the desires of the people we are trying to serve in order to obtain the "best" balanced system which is acceptable to the public—will be used—and is financially feasible.

SUMMARY

The challenging importance of the Interstate Highway Program and the cost of this program and the current economic problems facing the United States emphasize the need for cooperation and coordination both within and between jurisdictions. As the result of the Transportation Program and the Pilot City studies, San Diego is now beginning to accumulate a fund of basic factual information which enables us more adequately to define and measure urban transportation problems. We have found that the Advance Transportation Planning Team and the Technical Coordinating Committee provide the tools to effectively and intelligently solve together the complex technical problems involved in the planning of the Interstate, the freeway, and the major street system of a metropolitan area. It is imperative that technical people approach the job in a spirit of full cooperation. We have found in San Diego that this approach works. It has resulted in public confidence in the joint planning effort as applied to the highway program. This is demonstrated by the fact that nearly all our freeway route adoptions and freeway agreements are approved with little or no controversy.

In San Diego the objective was to establish the function of urban transportation planning on a continuing basis commensurate with the needs and growing importance of moving people and goods. Only through the continuing effort of cooperative transportation planning, coordinated with one goal in mind and with the maximum implementation of the Federal highway program, will local governments be able to resolve their urban transportation problems.

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JOURNAL
CITY PLANNING DIVISION
Proceedings of the American Society of Civil Engineers

COORDINATING PUBLIC WORKS AND URBAN RENEWAL IN KANSAS CITY, KAN.

Eldridge H. Lovelace,[1] F. ASCE and Ramon Duran[2]

SYNOPSIS

The Housing and Home Finance Agency through the establishment of the General Neighborhood Renewal Plan procedures has provided a useful and effective means to coordinate the timing and location of public works with urban renewal programs. The Argentine neighborhood in Kansas City, Kansas serves as an excellent demonstration of the local benefits to be realized from these procedures. These point to and emphasize again the importance of proper scheduling of both public works and urban renewal activities as a part of urban planning and development activities.

INTRODUCTION

On June 5, 1958 the Kansas City Times, a morning newspaper, reported to the citizens of Kansas City, Kansas that the City Commissioners had enthusiastically endorsed a ten year $11 million General Neighborhood Renewal Plan for the Argentine section of the city, estimated to cost the city taxpayers as little as $755. This announcement culminated several months of "crash" planning work by the Planning Commission staff under the direction of the consulting firm of Harland Bartholomew and Associates and with the assistance of the local Urban Renewal Agency.

The City of Kansas City, Kansas, the second largest city in the Kansas City area, was developed from what were originally five small towns. (See Figure 1.) The present population of the city is approximately 135,000. Certainly no single factor has influenced the degree and pattern of development of the metropolitan area as much as the natural features of the land. The city is bounded on the north by the Missouri River and bisected by the Kansas

Note: Discussion open until May 1, 1960. To extend the closing date one month, a written request must be filed with the Executive Secretary, ASCE. Paper 2307 is part of the copyrighted Journal of the City Planning Division, Proceedings of the American Society of Civil Engineers, Vol. 85, No. CP 2, December, 1959.

1. Partner, Harland Bartholomew and Associates, St. Louis, Mo.
2. Director of Planning, Kansas City and Wyandotte County, Kans.

River with the original City of Kansas City, Kansas developing around the junction of these two large rivers. Except for the level lands in the flood plains of the rivers, there is rugged or rolling topography throughout much of the area, with the more rugged area to be found along the bluffs adjacent to the two rivers. The slopes of these bluffs usually exceed 15 percent. As a result, much of the urban development has been confined to the level flood plains or the plateau areas above the bluffs.

Kansas City, Kansas has a long history of municipal planning. The first planning commission was appointed June 29, 1920. A major street plan, which resulted in many of the city's most useful present-day thoroughfares, and a zoning plan were adopted in 1924. A thorough revision and extension of this city plan was undertaken between 1937 and 1941 with a new city plan being officially adopted by the City Commissioners in 1942. This plan was brought up-to-date in 1953 and 1954. The latest revision included a public works program calling for a ten million dollar general obligation bond issue to finance:

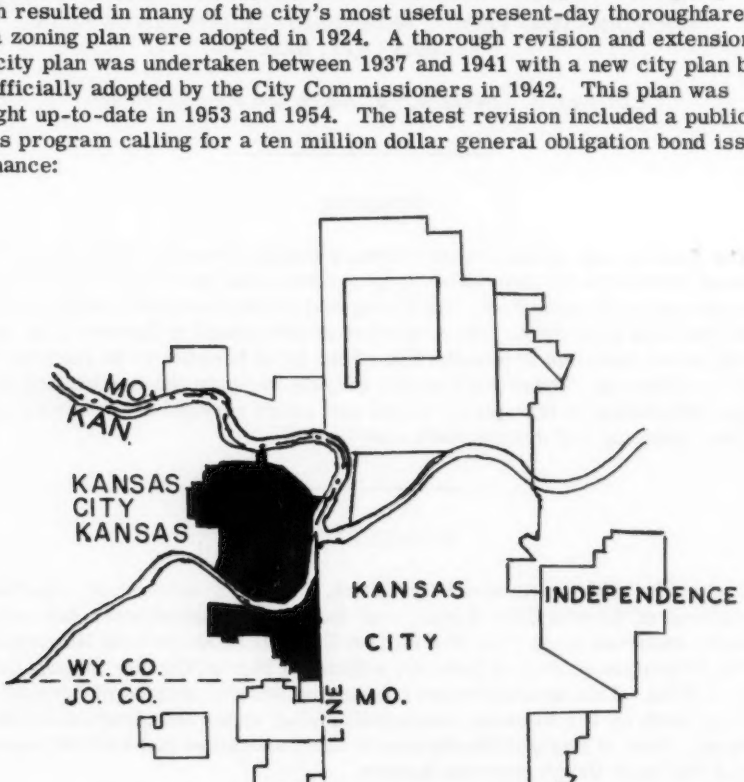

Fig. 1.

1. Streets	$5,400,000
2. Sewers	3,700,000
3. Public Buildings	650,000
4. Parks	250,000

In common with many cities, Kansas City, Kansas is plagued with a serious housing problem. City planning studies explored the extent of this problem and pointed out possible solutions. An urban redevelopment act was passed in Kansas in 1951 and an urban renewal agency established in Kansas City that year. An endeavor to capitalize on flood damage in the Armourdale area and thereby renew this area for land uses more contributory to the welfare of the city evoked a law suit which resulted in the 1951 act being declared unconstitutional. A second state law was also declared unconstitutional but a third was upheld by the Kansas Supreme Court in 1956 which permitted the second Renewal Agency, appointed in 1955, to proceed with confidence. The first "Workable Program" was approved in 1957. The Agency has one project in execution stages and another in final planning stages.

Federal Provisions for General Neighborhood Renewal Plans

Under the Housing Act of 1949 as amended, federal aid is available for areas that qualify and need either planned rehabilitation or clearance and redevelopment, or a combination of rehabilitation and clearance. Planning advances are made available to help the community finance surveys and planning work necessary before actual site operations can get underway and contracts entered into for further federal assistance. Temporary loans are used by the community as working capital in acquiring slum land and structures, clearing the site, and preparing the area for redevelopment or rehabilitation. When the area is ready for redevelopment or rehabilitation, land acquired is disposed of to private enterprise for its fair value for uses called for in the urban renewal plan. The difference between the return received from land disposition and the total cost of carrying out the project is its net cost. The federal government agrees to pay up to two-thirds of this net cost. The city pays the remaining one-third either through cash contributions or through land, public facilities, demolition, or other work contributed to the project operation.

Where a city can build a new school, park, or street improvement benefiting a renewal project such construction costs assist in providing its one-third share. However, most "project" areas are necessarily small and it is most difficult to so schedule public works improvements and urban renewal projects that the two would be mutually beneficial. Some broader and more comprehensive approach was needed.

Recognizing this need, the federal government in November of 1957 amended Section 102 of the Housing Act of 1949 to include a program entitled "General Neighborhood Renewal Plan (GNRP) Policies and Procedures".[1] A "General Neighborhood Renewal Plan" can be defined as a general plan for an urban renewal area of such scope that the urban renewal activities therein may have to be carried out in stages over an estimated period of up to ten years. It must be determined that in the interest of sound planning it is

1. Housing and Home Finance Agency—Urban Renewal Administration, Washington 25, D. C., Local Public Agency Letter No. 110, Nov. 22, 1957.

desirable that this large urban renewal area be planned for urban renewal purposes in its entirety. Federal funds are generally advanced for the preparation of such plans. Public improvements serving the neighborhood may receive credit as part of the city's participation in individual projects required to carry out the General Neighborhood Renewal Plan. This credit is allowed for improvements built anytime after the Housing and Home Finance Agency has approved the General Neighborhood Renewal Plan, even though individual renewal "projects" may not even be initiated, in parts of the neighborhood, for several years after this public improvement has been completed. However, the local community must proceed forthwith to initiate a specific project encompassing at least ten percent of the area of the neighborhood involved and then proceed in a progressive and consistent manner to carry out the entire neighborhood plan.

The Kansas City, Kansas ten million dollar public works program was underway when Local Public Agency Letter No. 110 describing the General Neighborhood Renewal Plan procedures was received. In addition, the school district had approved a $6,500,000 bond issue in 1953 and a second issue (of $6,850,000) was under consideration (and was subsequently passed). Study of the opportunities afforded by the Neighborhood Renewal Plan procedure in relation to the public works program by planning and renewal officials in Kansas City, Kansas led to the conclusion that, if the timing could be properly scheduled, a neighborhood plan should be prepared for the Argentine area. The city administration agreed to postpone the letting of certain key public works contracts; the officials of the Fort Worth office of the Housing and Home Finance Agency promised complete cooperation. There was no time to secure federal planning funds; the City Planning Commission agreed that its staff and consultants should prepare the Neighborhood Plan with the assistance of the staff of the Urban Renewal Agency and the race against time was on. (The letting of the key public works contracts could not be postponed very long and, once let, no federal credit could be obtained from them.)

The Argentine Neighborhood

The General Neighborhood Renewal Plan area chosen is located in the southwest section of the city called the Argentine district, one of the original towns which comprise the present Kansas City, Kansas. (See Figure 2.) It is situated on the south bank of the Kansas River three miles from its confluence with the Missouri River. In the late 1800's the location of the Atchison-Topeka and Santa Fe Railroad transfer depot, roundhouse, and coal sheds played a prominent initial role in developing the Argentine area. A smelting or refining company also located in the area about this time which received ore from the mountain area to the west and crushed, separated, and refined lead, gold, and silver. Thus, the name "Argentine" was derived from the silver smelter operation. The original plat of Argentine dates back to 1880 and included a portion of the flood plains and the south bluffs of the Kansas River. The plat contained the basic gridiron arrangement of streets which in most instances was poorly related to the rough topography, resulting in roads with steep grades, and poor building sites. (See Figure 3.) The lots in the plat were generally 25 feet wide. In 1909, Argentine and Kansas City, Kansas were consolidated. In 1951, after an excess of normal May and June rainfall, a critical storm began on the 9th of July. The rain continued and by July 12th,

the swollen waters of the Kansas River topped the levees and flowed swiftly through the area inundating the north section of the district to depths of five to thirty feet. Eight hundred persons were evacuated with no lives lost, the district was left in shambles, and the estimated damage was about $62,500,000. Only the lower portion of the General Neighborhood Renewal Plan area was affected by the flood waters. Today, almost eight years after the devastation, many of the inundated houses have been re-occupied, some receiving extensive repairs and others none or the basic minimum. Also, many of the industrial and commercial buildings in the original business district have been re-occupied and some new commercial buildings have been built. The commercial area has traffic congestion problems and lacks sufficient off-street parking facilities.

Within the Argentine district, an area of approximately 475 acres was chosen for the General Neighborhood Renewal Plan because of its need for renewal and because of the location of the proposed improvements that would finance the city's share of the program. The General Neighborhood Renewal

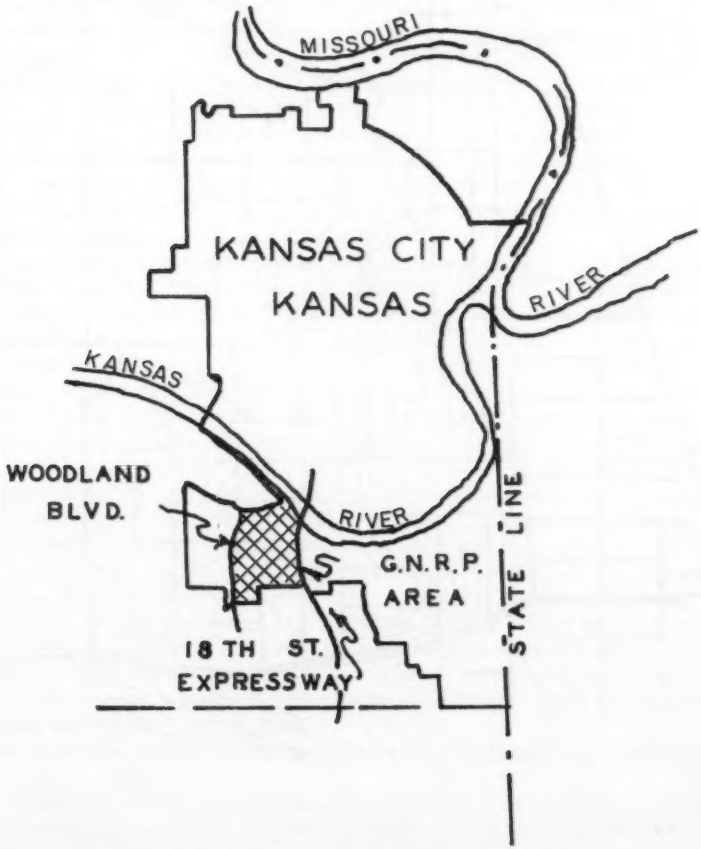

Fig. 2.

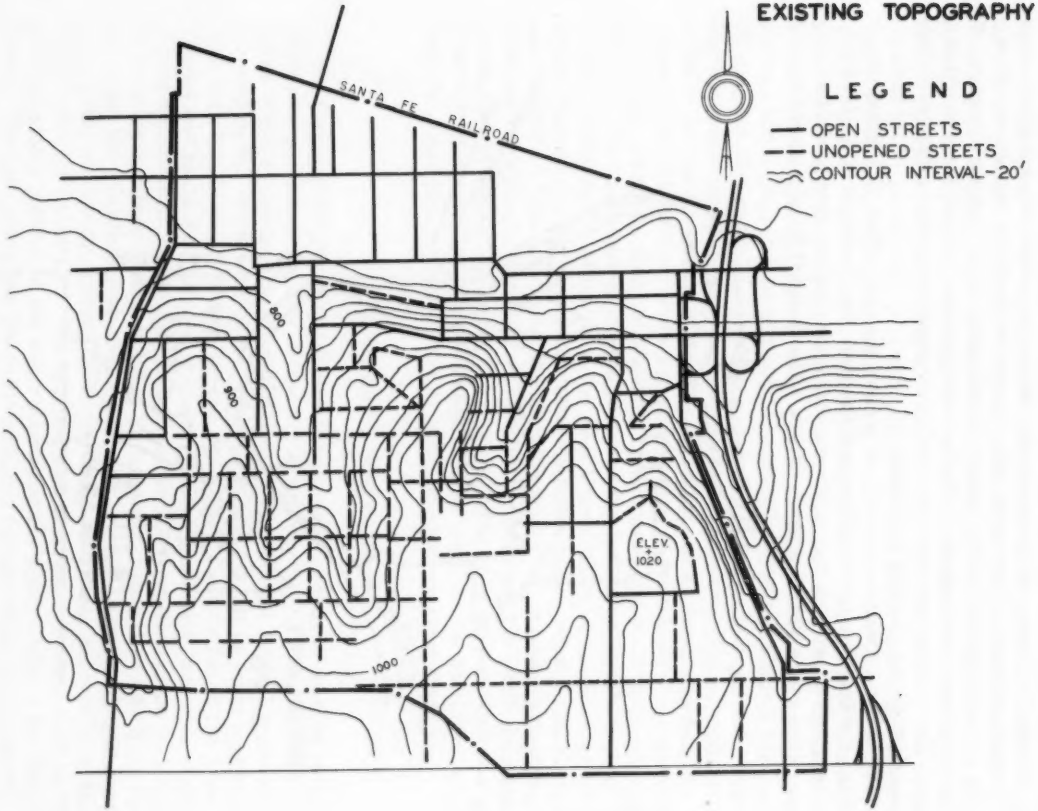
EXISTING TOPOGRAPHY
LEGEND
OPEN STREETS
UNOPENED STEETS
CONTOUR INTERVAL-20'
SANTA FE RAILROAD
800
900
1000
ELEV. 1020

Fig. 3.

Plan area forms a logical planning unit because it is bounded by natural barriers—the Santa Fe Railroad on the north, a limited access dual lane expressway on the east, (the Eighteenth Street Toll Expressway), a proposed limited access highway on the south, and a major street on the west. Because of the extreme topography and obsolete platting, less than half the area selected is improved.

Approximately 35 percent of the General Neighborhood Renewal Plan area has an average slope in excess of 15 percent. The area slopes from the south to the north with a difference in elevation of approximately 250 feet. The area contains 949 residential structures with 412, or 43.4 percent substandard or dilapidated,[1] and 109 non-residential structures with 40, or 36.7 percent substandard. (See Figure 4.) Therefore, of the 1,058 main buildings, 452, or 42.7 percent, were classified as substandard. The estimated number of families was 1,040, 940 white and 100 non-white.

Although street and alley rights-of-way represent over 23.3 percent of the General Neighborhood Renewal Plan area, less than half of the roads are paved and practically all of the alleys are unimproved or unopened.

The water mains are generally in satisfactory condition and provide adequate services in the developed sections in the more level areas. However, any extensive reuse of the isolated or undeveloped areas on top and along the bluffs will require additional water facilities. Although there are some sewer facilities in the General Neighborhood Renewal Plan area, the sewers accommodate both storm sewer and sanitary flow and it is not uncommon for manhole covers on the main business district street, at the base of the bluffs, to be hurled from their places by geysers of water as a result of a rainstorm and the fast runoff.

Public parks within the Argentine area are inadequate. The one athletic field, with an area of eight acres, has covered bleachers, a lighted baseball field, softball field, and toilet facilities. There is also one neighborhood park containing five acres. However, a fire station is located in the northeast corner, a library building in the center, and, adjacent to this small area, is an elementary school on a site of only 0.4 acres. The school building, built prior to 1900, is obsolete and inadequate. Another elementary school, in the northwest section of the General Neighborhood Renewal Plan area, is on a site of seven-tenths of one acre. The latter site is occupied by two separate buildings—an old building constructed in 1888 and a three-room frame building constructed in 1952. This school, because of its proximity to industry and nearby schools, should eventually be abandoned and the students taught in other elementary schools. The General Neighborhood Renewal Plan area also contains a high school on 2.3 acres of land. This school was recently remodeled at a cost in excess of 1-1/2 million dollars and is in excellent condition. This new facility, however, is in serious need of off-street parking. Although the high school site is limited in area, an athletic field containing 5.4 acres is located a short distance from the school. The field has excellent bleachers and ample parking area.

To combat the public facility deficiencies in the Argentine area, the city

1. U. S. Department of Commerce—Bureau of the Census, 1950 U. S. Census of Housing, Kansas City, Kansas Block Statistics, p. 2 "A dwelling unit is 'dilapidated' when it is rundown or neglected, or is of inadequate original construction, so that it does not provide adequate shelter or protection against the elements or it endangers the safety of the occupants."

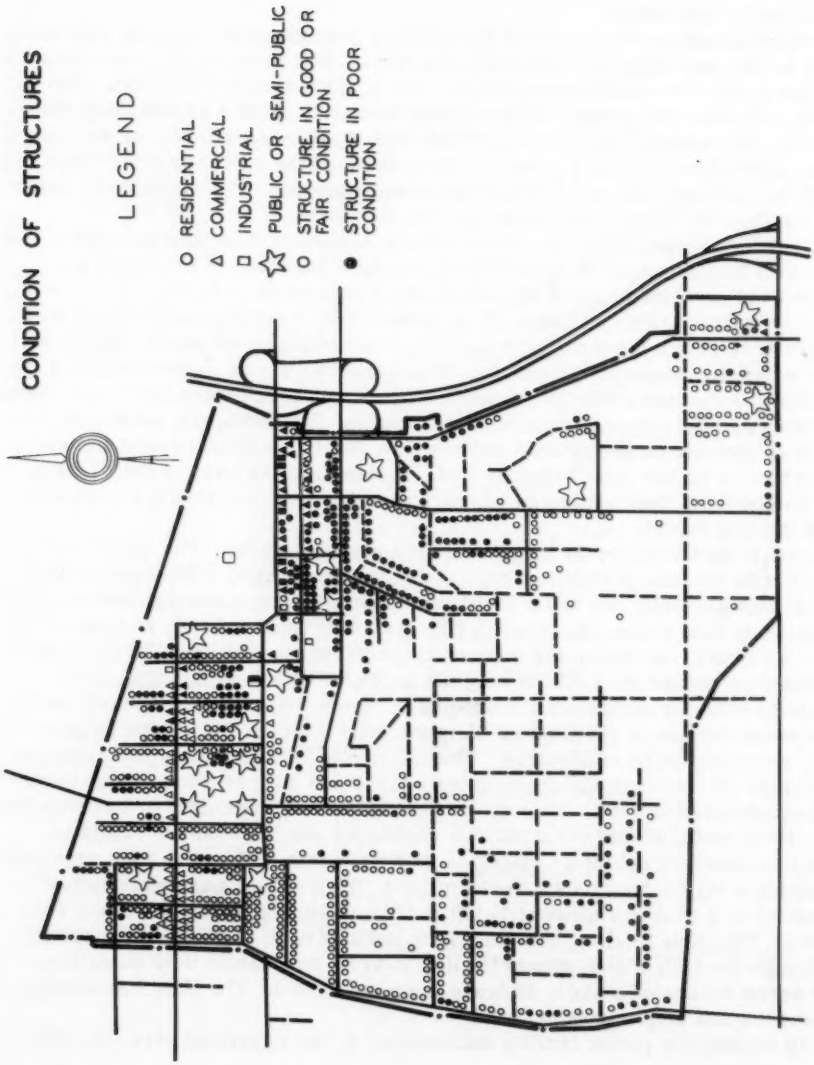
CONDITION OF STRUCTURES
LEGEND
RESIDENTIAL
COMMERCIAL
INDUSTRIAL
PUBLIC OR SEMI-PUBLIC
STRUCTURE IN GOOD OR FAIR CONDITION
STRUCTURE IN POOR CONDITION

Fig. 4.

Master Plan recommended several improvements in the current public works program that would relieve the flooding in the business district, traffic congestion, and overcrowded and obsolete school facilities. (See Figure 5.)

The storm sewer scheduled for construction in this area to alleviate the flooding conditions, will serve approximately 75 percent of the Argentine area or 729 acres. The plans call for approximately 6500 linear feet of storm sewer of which 1500 feet will be a 10' x 10' concrete box emptying into the Kansas River just east of the General Neighborhood Renewal Plan area. The remaining 5000 feet will be a 9' x 9' box. The average depth of backfill for the sewer will be 25 feet to flow line and much of the 9' x 9' box will require extensive rock excavation. The entire project is estimated to cost in excess of two million dollars of which approximately 70 percent, or $1,659,000 will be eligible as a local grant-in-aid to defray the city's one-third share of the net cost of the ten-year urban renewal program.

The Board of Education proposes to expand the existing elementary school site adjacent to the neighborhood park to approximately two acres. A new elementary school will be constructed at an estimated cost of $385,000 and the existing school will be razed. One hundred percent of the construction and acquisition cost will qualify as a local grant-in-aid. To alleviate the acute shortage of off-street parking for the high school site, the Board of Education also proposes to acquire an adjacent area and construct off-street parking facilities which is estimated to cost $125,000 - 23 percent, or $29,000 is eligible for the city's share.

A major east-west street will be widened and improved and several jogs eliminated which will expedite the flow of traffic through the Argentine district and improve the business district traffic circulation. The total cost of the project is in the vicinity of $750,000. It may be possible to obtain 100 percent of the cost as a local grant-in-aid. The total of these non-cash credits amounts to $2,823,000.

The Neighborhood Plan

The neighborhood plan (see Figure 6) calls for major rearrangement of the street system and a more logical disposition of the basic land uses within the General Neighborhood Renewal Plan area. The reuse for the flood plain area would be predominantly for industrial and commercial purposes. Many streets and alleys would be vacated in order to combine small parcels of land into larger industrial and commercial sites. Major streets would be widened both in right-of-way and surface width to conform with recommendations of the major street plan. In many instances the neighborhood plan requires resubdividing to provide a street system that conforms with the existing topographic conditions to obtain desirable residential sites.

Four major classifications of land uses are proposed: industrial, commercial, residential, and public and semi-public. Industrial uses would occupy a portion of the flood plain adjacent to the Atchison-Topeka and Santa Fe Railroad. The area is presently occupied by substandard homes which would be cleared and the land assembled to provide adequate industrial sites. The commercial uses would largely remain in their present location in the flood plain area adjacent to the industry where they may serve as a buffer between industrial and residential uses. Substandard commercial structures would be removed, others rehabilitated, and ample off-street parking facilities

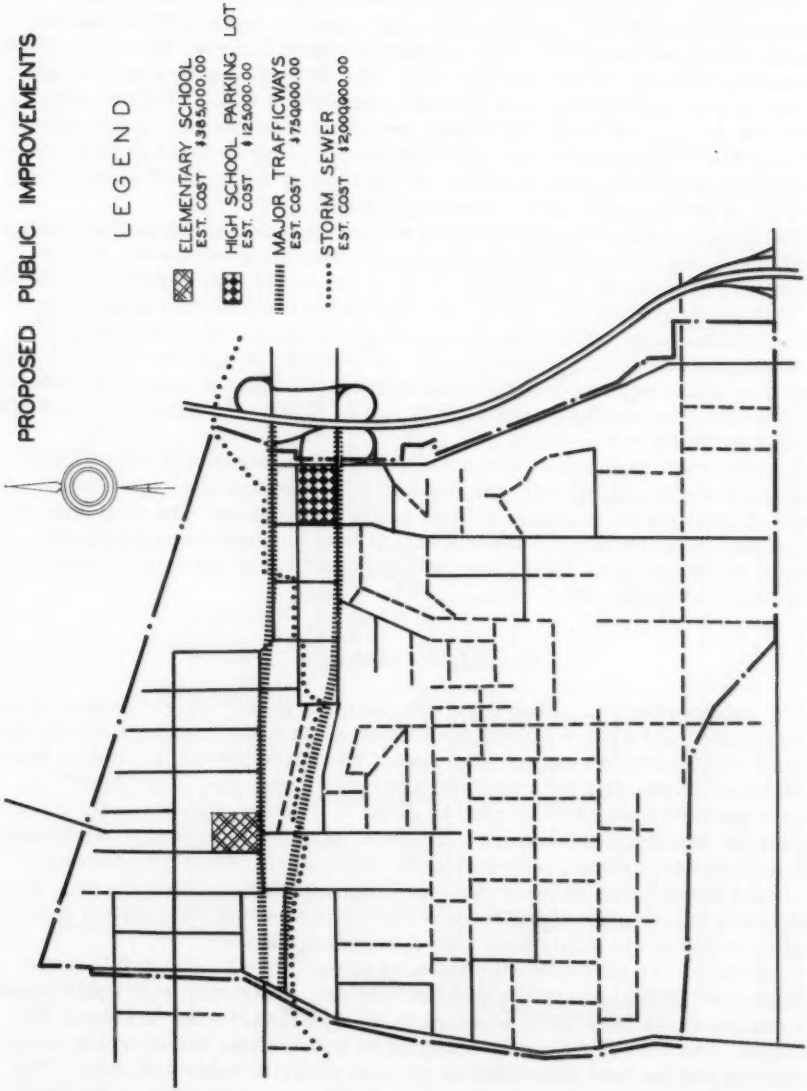
PROPOSED PUBLIC IMPROVEMENTS
LEGEND
ELEMENTARY SCHOOL
EST. COST $385,000.00
HIGH SCHOOL PARKING LOT
EST. COST $125,000.00
MAJOR TRAFFICWAYS
EST. COST $750,000.00
STORM SEWER
EST. COST $2,000,000.00

Fig. 5.

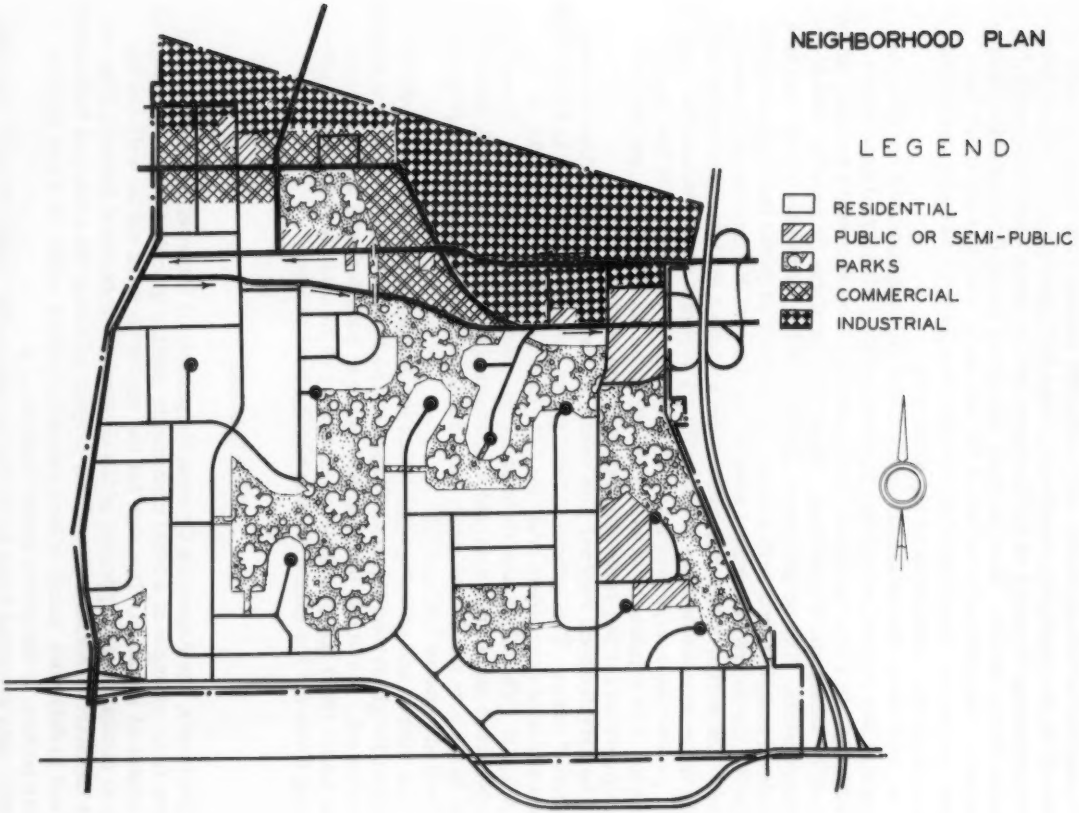
NEIGHBORHOOD PLAN
LEGEND
RESIDENTIAL
PUBLIC OR SEMI-PUBLIC
PARKS
COMMERCIAL
INDUSTRIAL

Fig. 6.

provided throughout the business district. The residential and public areas would occupy the remainder of the neighborhood and be separated from the commercial and industrial areas by a major trafficway. The existing residential area in the south portion of the neighborhood plan would require a substantial amount of clearance and redevelopment with new subdivisions replacing the obsolete platting. Paved streets and utilities would be installed throughout the replanned residential areas and approximately 700 residential lots containing lot areas of 8,000 square feet or more provided largely for single-family homes. Most of these lots would be located above the bluffs and would have attractive views of the two-mile wide Kansas River flood plain and river. Local realtors envision this location as being one of the most desirable residential areas of the city.

In most cases the numerous areas within the neighborhood occupied by good and fair housing would receive only rehabilitation treatment where necessary. In a few instances, clearance would be necessary because of the extent of substandard conditions, changes in land use or need for street rearrangements. The neighborhood plan places the extremely rough land in a proposed neighborhood park system. A network of parks has been proposed to serve the entire residential area of the General Neighborhood Renewal Plan. The design of the park area would include a system of footpaths connecting the new elementary school with all sections of the residential area. Two pedestrian overpasses would allow children to cross over the major streets. The neighborhood park area would be doubled and a new ten acre park provided for the residential area on top of the bluffs.

The neighborhood renewal plan would be divided into five urban renewal "project" areas. The estimated total gross cost of all projects is $10,920,000. The estimated net project cost, less the land disposition proceeds, is $8,472,000. The city's one-third share is, therefore, $2,823,755. However, the non-cash local grants-in-aid mentioned above total $2,823,000, thus the cost to the city for the ten year, eleven million dollar renewal program is estimated to be as low as $755!

The survey and planning application for Project No. 1 was filed with the General Neighborhood Renewal Plan and also received approval by the federal government. A $60,000 planning advance was awarded, and at the present time (June 1959) the Urban Renewal Agency of Kansas City, Kansas is preparing plans for the execution stage of the first project.

CONCLUSION

Obviously, the Argentine General Neighborhood Renewal Plan, described above is an example of a local community moving quickly to take advantage of an expedient situation. In order for the matter to work out so well and the city to obtain federal approval of the General Neighborhood Renewal Plan before the start of construction of any project affecting the area, one contractor agreed to delay one month before receiving a work order on a one million dollar portion of the storm sewer contract.

With data available from a reasonably up-to-date comprehensive planning study it is possible to prepare the General Neighborhood Renewal Plans without too much difficulty or expense. The Kansas City, Kansas planning commission, for example, has a staff of only three persons. On the basis of this experience it would appear most advantageous for cities to prepare General

Neighborhood Renewal Plans in the detail outlined in Local Public Agency Letter No. 110 for all residential neighborhoods as a part of their usual city planning programs. These could then form the basis for both the urban renewal program and the capital expenditure program. Of course, many neighborhood plans might have to be changed and modified before being carried out by the renewal "project" process. However, the advantages of the more detailed neighborhood plans and programs more than warrant the time and money required to prepare them - irrespective of the possible financial advantages to the city occasioned by federal policies.

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AN ENGINEERING VIEW OF PUBLIC TRANSIT[a]

John C. Kohl,[1] M. ASCE

ABSTRACT

This paper, intended to stimulate discussion rather than to present formal conclusions, describes five divergent views of public transit. Only comprehensive plans developed by civil engineers, firmly grounded in planning, offer hope for effective use of mass transportation in the modern urban evolution.

The civil engineer has long been active in the planning, design, construction, and even operation of public transit systems. Yet, among all of the groups now concerned with revitalizing this once vigorous and essential public service, the civil engineers have voiced no collective view. Except for a few—a very few—of the older consultants, have the engineers been accorded much serious attention in the recent attempts to resolve the problems of urban transportation. In fact, civil engineers are frequently castigated by other groups, chiefly the social planners, for their supposed aggravation of metropolitan problems through their rapid expansion of our highway system.

Sensitive to this criticism, the American Society of Civil Engineers acting through its technical divisions has established committees on Urban Transportation and on Mass Transportation to study and to recommend courses of action in these vital areas. The City Planning Division, in organizing the Committee on Mass Transportation less than a year ago, charged its new group with the broad task of determining, if at all possible, the "role of public transit in the development of urban areas."

Out of this committee study and deliberation, it is the hope that two results will be achieved: first, that there be developed a report upon which a definitive statement of Society policy might be prepared; and second, that there

Note: Discussion open until May 1, 1960. To extend the closing date one month, a written request must be filed with the Executive Secretary, ASCE. Paper 2309 is part of the copyrighted Journal of the City Planning Division, Proceedings of the American Society of Civil Engineers, Vol. 85, No. CP 2, December, 1959.

a. Presented at the May 1959 ASCE Convention in Cleveland, Ohio.

1. Prof. of Civ. Eng. and Director of the Transportation Inst., Univ. of Michigan, Ann Arbor, Mich.

might be a renewed appreciation of the role of the civil engineer as an essential and effective force in city or urban planning.

In this presently confused field of public transit, the accomplishment of these objectives is neither easy nor swift. Nevertheless, the committee,* made up fortunately of busy members of the Society and of a wide range of backgrounds and interests, has already made significant progress. It is upon such progress that these comments are founded.

At this point, then, it should be clearly understood that the following remarks are not an official expression of a fully-formulated, committee view of "The Public's Stake in Revitalized Public Transit." They are rather a personal interpretation presented as an informal progress report; they are intended to contribute perspective and to stimulate constructive discussion.

Initial exploratory discussion among the committee members at their first fully organized meeting in December 1958 revealed a variety of opinions and views regarding mass transportation. These, it was agreed, would have to be analyzed before there could be any clear understanding of the problems. The The study thus far indicates five seemingly distinct classifications: (1) The Passive, or Do-Nothing-Drastic viewpoint; (2) The Reactionary, or Anti-Auto viewpoint; (3) The Progressive, or "All-Rubber" viewpoint; (4) The Ultra-Progressive, or Space-Age viewpoint; and (5) The Comprehensive, or Rational viewpoint. An elaboration of these categories may be helpful.

1. The Passive, or Do-Nothing-Drastic group holds that conditions are really not as bad as they seem; troubles with transit are temporary and eventually will disappear.

A typical member of this group will prefer to drive his own car but would like to feel that transit is there when he wants it; the weather may be bad for driving some days, and on others his wife may demand their only car. He instinctively opposes any and all cuts in transit service, or fare increases. He believes that transit management can somehow maintain an economic balance through use of better or smaller buses, or faster service, or other "easily accomplished" improvements that will attract sufficient riders to maintain solvency. He will even disclaim the need for expressways when they come too close to his home, or to his business.

Between brief periods of indignation when he fancies his personal convenience or his pocketbook adversely affected, he blissfully ignores the larger problems of urban transportation. This "Passive" group cannot be expected to do otherwise for it is made up of the bulk of our citizens, the laymen, whose only interest in transportation lies in its immediate service.

People as a whole can be expected to resist any and all changes, no matter how minor or gradual, in the transportation services which they use as a daily matter of course. They must be induced, largely through indirect measures, to accept change and to accommodate themselves to it. Professional integrity demands that the planners and engineers devise such changes in strict con-

* Professor Donald S. Berry of Northwestern University, John B. Ecker, consulting engineer, Professor John C. Kohl of the University of Michigan, William R. McConochie of DeLeuw, Cather and Company, Park H. Martin, Pennsylvania Secretary of Highways, Dean Frederic T. Mavis of the University of Maryland, and D. Grant Mickle of the Automotive Safety Foundation.

consistency with the public's needs, desires, and long-range best interests. Unsoundly, dishonestly, or emotionally planned changes lead only to chaos.

No civil engineer worthy of the title should ever be found in this "Passive" category.

2. The Reactionary, or Anti-Auto, group surprisingly does include numbers of professional planners, and even a scattering of engineers.

A typical member of this group holds that the motor vehicale is at its very best a "mixed blessing," as a recent British writer(1) so aptly coined the phrase, or at its very worst, "a medieval concept in a mass-production age," according to G. E. Kidder Smith of the American Institute of Architects, in his letter of March 28, 1959 to the New York Times.

> "Public transit is the only hope for cities and their central business districts," runs the argument of The Reactionary. The auto is highly inefficient on every score as compared to transit; personal transportation by auto not only is alleged a waste of valuable resources, but it is charged as the agent of destruction of the amenities of civilized living; noise, fumes, smog, urban sprawl, juvenile delinquency or what-ever-else-is-wrong are all laid to indiscriminate use of autos. Stern restrictive measures should be invoked and automobile access to downtown areas might well be denied.
>
> Less vehement, more mildly disposed members of the "Reactionary" school reiterate that the urban world has gone wrong because the traffic engineers forget that they are "moving goods and people" and have concentrated, instead, upon moving vehicles. The motor vehicle will automatically be relegated to its proper, incidental place and urban transit correspondingly revitalized, they imply, if we bring again into focus "moving people."

3. The Progresisve, or All-Rubber coterie, immediately shouts, "Not so! The public has already decided how they want to move, and most definitely their choice is in their own automobiles, not public transit." Even brief study of transit riding statistics, both here and abroad, would seem to lend strong support to these claims that the automotive age is here and should be recognized in our planning.

Professor E. A. Gutkind of the Institute for Urban Studies at the University of Pennsylvania, in his letter of March 6, 1959 to the New York Times, epitomizes this viewpoint:

> "All cities, wherever they are, have outgrown their original conception, their original scale and their original structure. No reforms can cure the ills which stem from this discrepancy. . . .The only effective solution is the systematic decentralization and dispersal of our cities in which the metropolitan empires disappear and are replaced by by an organic redistribution of population and industry."

While Professor Gutkind does not thus explicitly commit this redistribution to automotive transportation—the All-Rubber System, such a conclusion is almost obvious.

A British comment at the 1956 London Conference on Urban Motorways reveals the strength of the "All-Rubber" viewpoint:

"In the United States mass transit is a conversation piece, and the urban motorway a fact." That view, it was hinted, would be desirable for Britain.

Many civil engineers, particularly those in highway and traffic fields, have warmly embraced such thoughts because they lend support to a tangible outlet for their technical energies, and because they are seemingly compatible with a pragmatic mind. Remaking the urban landscape to suit the automotive age has, it must be conceded, an appealing logic, once the basic premise is accepted that, "The people, by the neglect of transit and demonstrated preference for the auto, have freely made the decision." Intensive highway and traffic action is, thus, assumed in tune with the times.

4. The Ultra-Progressive viewpoint concurs with the proposal that our whole urban complex be adjusted to the times and disagrees only on the timing. Instead of the automotive age, which, they say, is rapidly drawing to an end, the framework of planning should embrace the Space-Age just now beginning.

Colonel Sydney H. Bingham, the well known former general manager of the New York Transit Authority and now an active transit consultant, crystallized this view in a talk to the Society of Automotive Engineers earlier this year when he said, "With the surface avenues of traffic already congested and underground avenues too costly to contemplate, the space above the surface provides a logical medium in which to operate."

While Col. Bingham advocates the use of a monorail system suspended in space but firmly anchored to the ground, there are others who would take both transit and personal transportation completely into the air. The Sunday supplements are continually picturing the "sky bus," the individual helicopter and sky cars, not of remote imaginary types but actual models in the experimental stages of military development. The London correspondent of the Altantic Monthly reports in the current May, 1959 issue that a Britisher, Ian Nairn, is urging development of "new patterns of personal transport which take up no more room than a man himself," and that we forget about new roads as we "leave the automobile to stew in its own jam."

Admittedly, this out-with-the-old, in-with-the-new approach is attractive, particularly to the younger engineers who have unfettered minds. In an era of almost fantastic technologic advance, it is conceivable that all can become butterflies, skim over barriers of surface congestion, and attain a hitherto unimagined mobility which will revolutionize even the trends of present living. Realities of economics and human inertia will probably continue to make change relatively slow even by jet-speed standards, but the possibilities of such change must be evaluated.

5. The Comprehensive, a fifth and last grouping of identifiable viewpoints on public transit, is characterized by its willingness to weigh and consider, by its struggle for a rational approach based upon engineering methodology. A major tenet of this group is that traffic movements and personal travel desires are predictable, and that mathematical relationships can be formulated to forecast transportation demands along with guidance for planning the nature and capacity of transport facilities.

It is this group which believes that the adjustments of the urban pattern can gradually be achieved with a minimum of wasted energy and resources, and with a maximum of harmony in human tradition and aspiration. It is slow to voice an opinion because it hesitates to be sensational without substance.

Wilfred Owen, the brilliant scholar at the Brookings Institution who has contributed so many thoughtful observations on the metropolitan scene, concludes that supplying of facilities is only half the problem. The other half, in his view, lies in creating an urban environment in which the transportation system has a chance to work—the organizing of land uses so that traffic generated from their arrangements and densities will not overload the system, and also will provide adequate traffic volumes for efficient operation.

Obviously, measuring of transit and traffic demands, exercising controls over land uses, and providing matched facilities in any environment short of absolute dictatorship calls for the highest planning skills. A cardinal note of caution for the planning engineer is implicit in the writing of Jane Jacobs in Fortune Magazine for April, 1958, when, under the title of "Downtown is for People," she warned:

> "There is no logic that can be superimposed on the city; people make it, and it is to them, not to buildings, that we must fit out plans."

Fitting plans for urban transit is not a new task for civil engineers but the circumstances under which planning has been conducted during the last generation have understandable diminished their interest. They were discouraged when public transit became so bedeviled by emotional, political, and social agencies whose vested interests have so often been masked by popular slogans, rating at their worst as cliches, and at their best as pious platitudes. In consequence, many turned to other endeavors and neglected their professional responsibility to public transit.

The civil engineer, innately honest and a realist, is often closer to an appreciation of human values than numerous self-styled public servants. Attracted again by the very complexity of the urban transportation "mess" which has developed, a revitalized professional interest can again exert constructive influence to enhance the public's stake in public transit.

It seems appropriate that Wilfred Owen be quoted to conclude this expression of an engineering viewpoint:

> "Transportation is the greatest tool of the planner, and, conversely, planning is the greatest hope for the salvation of the transportation industry. With so much at stake, it is a tragedy that we refuse to understand fully that neither can succeed without the other."

REFERENCE

1. C. D. Buchanan, Mixed Blessing - The Motor in Britain, Leonard Hall, Ltd., London, 1958.

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Note: Paper 2324 is part of the copyrighted Journal of the City Planning Division, Proceedings of the American Society of Civil Engineers, Vol. 85, CP 2, December, 1959.

URBAN EXPRESSWAYS: JOINT PLANNING OF TRANSPORTATION AND LAND USE[a]

Discussion by Nathan Cherniack

NATHAN CHERNIACK,[1] F. ASCE.—". . . transportation planning and land use planning are inseparable." Author Creighton is to be commended for his courage of going right back to fundamentals to one of the rock bottom axioms of planning, re-examining and re-establishing its validity and thus indicating how this axiom can be more effectively utilized in planning procedures.

In the process of re-examination, however, author Creighton in an otherwise sound presentation has perhaps unintentionally made a few serious omissions which this discusser proposes to call attention to. For example, Creighton says: "People think of transportation in terms of facilities such as highways, streets, rails," and should think in terms of waterways and airways, as well, "and in terms of movement such as moving vehicles or moving persons," and moving freight and cargo, as well. One of the myopic idiosyncrasies of transportation researchers is that they frequently overlook entirely, the above omissions and think of transportation only as passenger surface transportation.[2]

Further on author Creighton says, ". . ., let the reader continue to think of the dominant item in transportation as vehicles and persons in motion, . . ." The problems of transportation of vehicles, people and goods become equally formidable when drivers desire to stop their motion and come to rest but cannot, for lack of space—no place to park autos, no place to unload goods from trucks. The equally important terminal problem of transportation, particularly in urban areas, is that of standing vehicles, as well as that of vehicles in motion. In fact, the inability to move rapidly on expressways may at times result largely from the fact that vehicles desiring to stop have no terminal space to be absorbed in, and so interfere with other vehicles which desire to keep in motion.

So author Creighton continues—"Activities require space." How true! The off-street auto parking and off-street truck berth problems would not arise if adequate space in desirable locations were available for these activities at reasonable costs. But usually there is a dearth of such off-street spaces and that is the terminal problem of highway vehicles.

The author continues—"Any encroachment upon the space needed by an activity jeopardizes the performance of that activity." Lack of terminal space

a. Proc. Paper 2048, June, 1959, by Roger L. Creighton.

1. Economist, The Port of New York Authority, New York, N. Y.

2. This discusser has elaborated on this point in a paper presented at the 1959 ASCE Convention in Cleveland, Ohio, entitled "Passenger Data for Urban Transportation Planning." (To be published in the Journal of the Highway Division.)

certainly does jeopardize performance. Today most urban areas, particularly the older areas, are usually too intensively developed with buildings (i.e., excessive floor areas for the available land areas). As a consequence, these areas have far too little off-street space available for truck loading berths, for maneuvering trucks into berths, for parking of trucks while waiting to load or unload, and for parking autos of employees and visitors to buildings. Because of these deficiencies, production efficiencies may be drastically reduced and freight costs may be higher than they otherwise would be with adequate terminal space. Some corrections of these situations have been realized through zoning amendments to city ordinances requiring off-street parking and off-street truck berths. But far more of such space in central core areas is badly needed.

Continuing, the author states, "A residential neighborhood is also a collection of activities: . . . Also included are minor movements of vehicles and persons necessary to maintain this web of social interaction." In connection with this statement, it is interesting to point out these facts. For the purpose of planning expressways and federally aided highways, trip data on typical weekdays have been collected for more than a decade by the U. S. Bureau of Public Roads by the "home interview" method. Samplings of 5% to 10% of the households in study areas have been made in more than 100 cities. Most of the sampled trips are, as the author says, and correctly so, "minor movements of vehicles," —neighborhood shopping to the "butcher, the baker," taking the children to school, and so forth. Only a fraction of the (5% - 10%) sampled trips are to and from important destinations where vehicles are concentrated sufficiently to really determine the vehicle demand on existing major arterials, and to serve as bases for the planning of future expressways. These typical 24-hour weekday trips may furnish a faithful picture of a study area's trips, but, in the opinion of this discusser, not enough of a representative picture of urban highway travel on important arterials. These sample trip data containing only small fractions of total trips that would constitute potential vehicle trip demands on major highways, have been processed by computing and recomputing, iterating and reiterating in an effort electronically to come up with effective determinants for future expressway alignments. Answers about future travel have been emerging from electronic computers, but are they the correct answers? For example, do 24-hour travel patterns assembled through "home interviews," adequately reflect rush hour journey-to-work movements directionally between residential zones of the study area and the different land use activities? No one really knows, because the very original data reflect, as author Creighton correctly puts it, largely, "minor movements of vehicles"; the major movements are thus effectively blurred in "home interview" assembled trip data.

The author then correctly describes the planning of transportation facilities through the medium of land use activities, thus. "Sketching at the metropolitan level, transportation facilities are planned to divide the area into building blocks, to serve major metropolitan activities (i.e., the CBD, industrial concentrations, major shopping centers, airports, residential areas) and to serve traffic." . . .

"By taking the view that land use is a set of activities which generate traffic and which also requires certain spaces in which to function, many old principles must be re-examined."

In order to implement the planning of transportation facilities according to the above concept, it is the opinion of this discusser that original data must

be assembled not through the technique of "home interviews" as has been the practice of the U. S. Bureau of Public Roads for more than a decade, but through interviews of persons at important places of public assembly. Such interviews would be made, for example, in areas of concentrated sites of employment, such as CBD's. There, workers would reveal, through really adequate and generous samplings, their journey-to-work movements, as well as the alternate modes of travel which they had chosen in reaching their work places. These interviews would thus disclose not only the total traffic volumes generated by various important sites and areas of employment, but also their linkage patterns with their correlative residential areas, in relation to such linkage determinants as distances, travel times, conveniences and other important determinants.

Similarly, travel data assembled in concentrated shopping, amusement, recreational, cultural and service areas, would reveal travel patterns and linkages which would be far more adequately representative than the corresponding data assembled through "home interviews." Such data would disclose more definitively, for example, peak period traffic patterns on existing major arterials, varying choices of existing alternate modes of travel and the varying proportions drawn from the various residential areas. Data assembled at zones of concentrated public assembly, in connection with various land use activities would thus disclose the extent to which transportation access, by people and goods, influences existing locations of urban land use activities, other than residences. (Creighton characterizes today's method of forecasting residential developments as "an amorphous spread of activities fairly evenly distributed throughout the planning area.") Based on the above proposed methods of assembling data perhaps alternate functional layouts for land use activitity clusters could be effectively studied, for the purpose of discovering the types of geometric clusters which would yield optimum linkages between different types of concentrated land use activities and their correlative residential areas.

Author Creighton then states that "measured relationships between the two items (land use activities and transportation planning) provides a bridge which connects them together." True. But as of today, that bridge has not yet been built; it is now only being conceived. Before even the structural materials required to build that bridge become available, there will have to be considerable research in this area of measuring relationships between land use activities and the effects of transportation on travel linkages. Only as and when that bridge is in fact begun to be built—only when principles of the geometrics of clusters and of optimum city forms begin to be evolved on the basis of such research material, will cities begin to be re-designed more functionally; and thus begin to evolve into better places to make a living as well as better places to live in.

FREEWAYS IN URBAN PLANNING[a]

Discussions by R. A. Haber and W. J. Miller, Jr., and George H. Herrold

R. A. HABER,[1] M. ASCE and W. J. MILLER, Jr.,[2] F. ASCE.—Mr. Lewis developed his paper after a review of the initial conception of the use of the word "freeway" which he traces back several years. It is thought that it would be appropriate for him to tie in the presently accepted definition of "freeway" as it has been advanced by the American Association of State Highway Officials, and in addition, to perhaps tie in the freeway definition as presently accepted with the definition of parkways and expressways.

A review of "A Policy on Arterial Highways in Urban Areas" published by the American Association of State Highway Officials defines "freeway" as follows:

> "A freeway is an expressway with full control of access. A freeway is distinguished from all other expressways by the degree of separation of crossroads and the manner of providing access. A freeway has no cross traffic at grade. Other expressways may have crossings at grade where separations are not justified by the volume of cross traffic. With "full" control of access, as distinct from "partial", a freeway has no private driveway connections and access connections are suitably spaced, made only at crossroads which are separated in grade or connected by right turns only and generally located and designed to provide safe and efficient access and through operation appropriate for the traffic. Under "Partial" control, there may be access connections at existing streets and at some private driveways, and they are more closely spaced. Other expressways may have full control of access for some sections, but a freeway has full control of access throughout."

Near the bottom of page 39, Mr. Lewis speaks of continuous routes free of traffic lights from New York to Chicago and from Maine to Washington along the eastern seaboard. At the present time a freeway system does not exist throughout the State of Delaware. Therefore, it would be more accurate for Mr. Lewis to say "from Maine to Washington, except through a small section of the State of Delaware".

Throughout the 9 steps shown on page 40, Mr. Lewis assumes that consulting engineers are automatically used by State Highway Departments in the engineering work necessary for the Interstate System. It should be pointed out that much of the work may be done by consulting engineers, but that this

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a. Proc. Paper 2055, June, 1959, by Harold M. Lewis.

1. Chf. Engr., Delaware State Highway Dept., Dover, Del.
2. Deputy Chf. Engr., Delaware State Highway Dept, Dover, Del.

is a choice to be made by the various states. Additional comments concerning the various paragraphs are as follows:

1. No comment.
2. Study need not be done by a private engineering firm.
3. Study and analysis need not be made by consultants.
4. No comment.
5. No comment.
6. The Department does not necessarily need to publish a report nor does the Department necessarily need to engage consultants.
7. The approval by the Bureau of Public Roads is not necessarily subject to a report being prepared and approved. It is subject to the submission by the State Highway Department of data on which approval can be based.
8. Design work is not necessarily apportioned to consultants. Many states do the design work for the Interstate System with their own forces.

On page 42 "Thoroughfare Plan", mention is made of the need to fit freeways into street thoroughfare plans for a metropolitan area. It seems important to point out here and in other parts of this paper that it is hardly enough for a local Planning Commission or similar agency to use the attitude, "We were not contacted" during the course of a line study. Actually, much grief can be spared the local agencies and the State agency if a large degree of "Inquisitiveness" on the local level is pursued. It is granted that the sponsoring agency, (in this case, the State) should fit their plans to local conditions. The local agencies can certainly make it their business to inquire into the State or regional agency plans.

On page 43 some discussion is presented about local traffic problems in interchange areas. It would be advantageous to the interested parties if some form of public hearings be scheduled and held as the design details were completed for interchanges within the urban area. Specific problems could then be worked out before construction, and I am sure that the local residents and businessmen would feel better about the proposed work. Perhaps this could be advanced in civic meetings, at service club meetings, and at local Chambers of Commerce meetings.

On page 44 it is pointed out in regard to the section on zoning, that under the Federal Legislation, commercial establishments are prohibited from Interstate highways. It follows, therefore, that such commercial activity can be expected to flourish in interchange areas, and in turn, that zoning requests for such activity can be expected to increase.

On page 45 in connection with the comments concerning the "Look Ahead" part of the paper, some reference could be made to the Sagamore Conference at which the role of the Planning Officials and the Highway Engineer was fully developed, in addition to the Seminars sponsored by the Institute of Traffic Engineers concerning Freeway Operations. These seminars have been conducted throughout the country during the past year, with additional ones scheduled in this year.

On page 46 reference was made to a super-highway master plan set up in 1924 by Daniel L. Turner. A copy of a print showing a similar master plan for a super-highway in Delaware was envisioned by the late T. Coleman duPont. This super-highway included not only the divided roadways, but also areas for pedestrians, railroads, and bridle paths. This perhaps would be of some interest in connection with these remarks about Mr. Turner. While the

sketch is not dated, the records of the Delaware State Highway Department indicate that this drawing was made about 1911.

GEORGE H. HERROLD,[1] F. ASCE.—Mr. Lewis presents the original concept of a freeway: Its use in the regional plan of New York and environs; the development of parkways for passenger cars only, servicing the home-to-work crowd, shoppers and office building patrons of New York City; and the general evolution of freeway concept in the Highway Act of 1956.

He reviews the impact of freeways on urban planning and the so-called master plan, including the barrier created between adjacent parts of the city because of the wide right-of-way required for a freeway. He notes that where freeways have been built, while they have improved circulation, they have not eliminated serious congestion in the downtown shopping and wholesale districts.

In reviewing the literature of the past few years on the value of freeways, it appears that there are some misconceptions, much confusion, and some serious doubts as to their value in intracity travel. Some freeway locations pierce right through residential districts, displacing many families, and removing from the tax roll much valuable property—all on the theory that they will relieve congestion in central districts. Where they adjoin public and institutional buildings they may also bring heavy traffic objectionably close. For example, in one capital city a freeway which cuts the city in two, skirts the capital grounds, and has an interchange immediately in front of the capital plaza. This interchange extends southerly between the two largest hospitals which would be reached by overpasses over the interchange.

Highway departments are versed in the economics of locations across country; in the economy of moving earth, building bridges, constructing pavements, devices for drainage, braided highways, and landscaping, but their field apparently ends here. They appeared to have no fundamental knowledge of a city, per se. Practicing city planners are of many professions—architects, civil engineers, economists, lawyers, landscape architects, sociologists, urban geographers, etc. City planning has thus developed in an idealogical manner from these various disciplines. It is natural for each profession to push forward its own major skill, and if the members of the profession have no technical training in highway location, they may not wish to "tangle" with a highway commission. Those who might be called conversational city planners but who do not speak the same language as business men or highway people have to choose between going along with the highway department or being ignored.

A comprehensive city plan requires a knowledge of the functions of a city, economically, politically, physically, and as to performance; a concept of land use and land abuse; the competition that exists for land for certain uses. The value of land is based on anticipated income. Income, in turn, depends on location; a superior location is one that is most convenient and attractive for a given use. The highest land values in a city are in the central business district. The permanency of these values is dependent on creating and maintaining districts of high purchasing power, and on methods of getting people with money to spend from these districts to the central business district by easy, attractive, and pleasant routes—parkways exclusively for passenger cars—like those leading into New York City.

1. Formerly Planning and Zoning Consultant, City of St. Paul, Minn.

Mr. Lewis mentions the Autobahns of Germany. These do not run through cities; they were made continuous by skirting cities, using undeveloped lands, and disturbing few people.

Because highway departments have built such fine highways across country, people have been slow in believing that a freeway through their city might be a moat or a chinese wall and an economic menace.

These controlled access and controlled exit freeways in cities have been "sold" to urban residents as a means of lessening congestion on city streets and in central business districts. As they do not or will not serve this function, why should they run through the city? It is believed that urban dwellers are beginning to take a long hard look at these monolithic structures that they must live with for years, if they are continued to be built.

The freeway idea for a city has been oversold. It requires the moving of thousands of people and the loss of much tax-paying property. These people must give up their homes, churches, schools, neighbors, and their valued social contacts. They lose the institutions they have built for themselves, their pleasures and profits, some paid for in taxes and some by private subscriptions. There is the loss of the money that they have spent on maintaining and operating these institutions for years. They have lost everything worth living for except, of course, that they are to receive some money in exchange for their home.

Where freeways are to run through cities they disturb all the utility facilities, sewers, water mains, gas mains, electric power, light cables, telephone and telegraph lines, and conduits. Where the freeway is depressed 18 to 20 ft below street grades, all these utilities must be dug up, lowered below the freeway, and raised again at tremendous expense. There is also the unknown expense of detours, disruptions of business, and annoyance.

A city is made up of blocks and streets. Each block is a traffic generator of from 5 to 30 cars. Every morning many of these cars leave for work in the central business district, manufacturing district, or other points. If one drives several miles to the freeway and several miles on the freeway and several miles after getting out of the freeway to one's destination, one has doubled his mileage and lost time. So why should one use it?

The use of the Edens Expressway, entering Chicago from the North Shore traffic corridor, has been analyzed in Traffic Quarterly, July, 1956. In this corridor, approximately 5 miles wide, there are two railroads and four highways which are not expressways. When the intent is to use the expressway for its entire length (13.5 miles), approximately 70% of the vehicle traffic in the corridor does so. But, for local trips, the use drops to approximately 20% because of the loss of time in entering and leaving the expressway.

The freeway is a fine idea for travel between cities but for intracity travel it is a great misconception of the needs of an urban community.

With respect to the thoroughfare plan and local traffic problems, it should be noted that in many cities these are federal and state trunk highways that are located to serve the metropolitan area in harmony with the urban plan. In such cities, if the freeway followed the edge of the city or paralleled railroad rights of way in the city, it could be reached in a few minutes from these trunk routes. Such a plan would (a) result in savings in the cost of the rights of way, (b) reduce the cost of utility relocations, (c) reduce the loss of taxes to the community, and (d) improve public relations.

Freeways in a city will result in much moving of business and obsolescence and blight in the new areas. The highway specialist for the U. S. Chamber of

Commerce, J. E. Johnson, in Traffic Quarterly, April, 1957, states "There will be a rush by many business men to relocate near the freeway." This is, of course, the natural thing to happen. The city streets leading to the access points or exit points of the freeway and interchanges will be rezoned for commercial use and businesses will move at great expense to these new locations. Old congested spots will disappear and obsolescence and blight set in. New congested spots will be created but there will be no decrease in congestion. These great changes are likely to offset the increase in values along the freeway. It is a well-known municipal fact that the cost of policing, fire protection, and welfare in a blighted district will run to more than five times the sum collected in taxes.

A freeway in a city is an enclosure between entrance and exit. It must be a self-contained unit for all emergencies that occur in it. Snow in northern states will blockade it at times. A 3-in. rain on its wide right-of-way will make a river over the pavement. It must be policed 24 hours a day. Cars catch fire at times. How will fire apparatus reach the burning car, and what about panic? If people in cars become sick, or there are accidents, will an ambulance be able to reach them? How will a car that runs out of gas be pulled out of the line of moving traffic? There will be many new problems within the freeway.

It is said that the government will pay 90% of the cost of the right-of-way and construction, but several states have stopped letting contracts because the government has failed to collect this 90% from taxed motorists.

To resolve this whole problem, the writer suggests, first, that each city decide whether it wants a freeway or not. If it does, it should employ a firm of consulting city planners of established reputation to work with the state highway department on the freeway location, and the city council should refuse to approve the freeway location until these two agencies come to an agreement. Freeways, if needed in an urban community, are too important to be left to a highway department.

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STANDARD FACTORIES IN EUROPE

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SYNOPSIS

The character and importance of small manufacturers in urban economy is discussed. The European practice of erecting standard factories is advanced as a solution to the industrial slum problem. The plants are analyzed as to their function, use, location, construction, etc. This is followed by examples in Europe of standard factories, sectional factories, workshops and multistory factories.

INTRODUCTION

Most old cities in America, as well as in Europe, have dense deteriorating zones of crumbling residences, dilapidated retail shops and many small and medium sized industrial firms. These are generally located near the town center. The marginal manufacturing establishments contribute often most heavily to the decay of their neighborhoods.

Unfortunately, while residences and shops have some flexibility of location and accommodations, the small plants and workshops have the least choice: Their high worker density requires facilities (lunch rooms, transportation, recreation) which cannot be provided by individual employers themselves—nearby existing commercial or public facilities are imperative. Horizontal and vertical trade linkages are extremely vital—the result is progressive clustering in definite sectors. And, most important, the producers have to find available low-rent premises.

Since many of them are starting in business or are, dictated by the type of process, product or trade practice, small establishments, they cannot afford to construct specialized buildings custom tailored to their needs. The manufacturers must take whatever accommodations they can get at the lowest

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possible cost: dilapidated office or loft buildings, garages and even residences. Invariably these premises are second hand, unsuited to specific industrial needs and way past their prime. The inefficient floor plans increase production costs; materials and scrap has to be stored outside; the streets are congested with unguided traffic and the workers have to endure dirt, fumes, lack of light and air. Space for expansion is severely limited. If the business expands, the confusion is compounded.

This state of affairs, coupled with the financial insecurity of the small industrialists, is not conducive to any owners' and workers' pride in their establishments or desire to improve the surroundings. Thus the small workshop is destined to be a permanent mixed land use and a despised corruptive influence.

Quite often exactly these city districts are placed under urban redevelopment schemes. What happens then? The displaced residents theoretically are resettled in new apartments; the retail shops do or should go to shopping centers that have space for rent. The small manufacturers either go out of business or create new slums elsewhere.

If the workshops and small producers do go out of business, the loss to the municipality is severe. Some of the reasons are: These manufacturers tend to be in diversified trades which provide a healthy and balanced economic base invulnerable to business cycles. A large number of the small plants are service industries needed to supply larger factories; also to attract and hold new manufacturers. The small factories employ a much higher number of workers per unit area than a big producer. They are less nuisance-producing, thus more compatible to urban development. Also, it must be remembered that the small workshops occasionally grow into huge manufacturing complexes—Ford started in a backyard garage.

The solution, as found in many cities in Europe, to this problem of beleaguered or displaced small industrialists is to build premises for rent. These are called standard factories.

The term "standard factory" needs some clarification. As understood in Europe and used in this paper, a standard factory is one or multiple units of enclosed space intended to be rented for manufacturing purposes. This space is built before the tenant is known. In American terminology "standard factory" is sometimes used to denote a structure which is built from standardized structural elements (trusses, panels, etc.). The fundamental distinction is that the latter are built for a specific tenant who may make minor alterations to the plan and who owns the plant after its completion.

The first obvious objection to a standard factory is that the space is built before the process to be accommodated is analyzed or even known—the old practice of putting a cart before the horse. But it is surprising how easily a manufacturer, especially a small one, can adjust his production layout to a good, uncluttered rectangular space. This has been proved innumerable times in European experience.

The primary purpose of standard factories is to provide space for rent for the indispensable small manufacturers who cannot afford to build their own premises. Since these factories provide various size units or contiguous units which can be combined in different size production spaces, the manufacturers can find room for expansion or otherwise adjust the plant to their requirements. When several standard units are placed together, various communal services (heating, goods movement, lunch rooms, etc.) become available at considerably lower costs—the small fellow can get some of the advantages of large scale operation.

Another great advantage is that standard factories are a tool which can facilitate urban redevelopment by providing premises for displaced workshops and preventing their demise with resulting loss in local employment. By providing rentable units, the municipality also keeps the location and appearance of the workshops under control.

Considering all these factors, the logical conclusion would be that it is to the advantage, almost the duty, of a municipality to initiate or foster the establishment of standard factories. They may not be immediately profitable in their rent returns in all cases, but the long range benefits are immense. This is not to say that the factories cannot be speculatively sound. But, as practiced in Europe, to fulfill the primary objective of the standard factories —cheap space for small manufacturers—some governmental subsidy is beneficial.

It should be emphasized that the units must be in lease-hold. Ownership by the small industrialists is too great a financial burden for them. It also complicates the transfer of the units from manufacturers who have outgrown the premises to new tenants.

The planning and design principles of standard factories are not different from those of contemporary specialized factories (in regards to structural systems, lighting, ventilation, etc.). But there are some elements which need modification.

The plant will be used for an unknown process and several different manufacturers may occupy the premises during the life of the structure. Therefore the floor plan must be suitable for all—the answer is a simple rectangle. The same considerations are valid for the provision of utilities. They must be accessible at all points in the production space—a standard grid is needed. The construction must be the most economical possible to assure the lowest rents.

The worker density in a small plant is much higher than in a big one. This must be considered in providing parking space, utilities and transportation. For the same reason relatively more thought must be given to the appearance of the plant—landscaping, screened outdoor storage yards, architectural details, etc. Good appearance attracts and holds the best workers—they are proud of "their place."

Canteens and recreation space (lunch hour) must be provided on a communal basis. Only a large manufacturer can afford to build individual facilities. A good industrial district would have cafeterias and green spaces anyway (at least in Europe) or, if the standard factories are close to residential or commercial districts, the facilities there may be utilized.

Since the processes are generally light and the material undergoes a high degree of improvement, the goods traffic is not too heavy. The plants would never need direct railroad sidings.

Because of the light materials' traffic, clean processes, unpolluted atmosphere, small amount of waste, human scale and high number of employees, standard factories can be located in close association with the town, if not actually inside it. In industrial districts the plants can be built on the boundaries to serve as a transition visually and functionally between residences and factories.

The examples illustrating these design and planning principles are given in the second part of this paper.

Standard factories can do much to improve the appearance of an industrial district. The buildings are usually grouped together by size and type. These

factories, of course, are almost identical in appearance. This can give some unification to an industrial district. There is no need to fear monotony —industrial structures assume interesting shapes without even trying. More than enough variety is provided by the special factories. It is, therefore, a welcome relief to see a group of uniform buildings.

The standard factories in Europe are all excellent in their aesthetic design. The reasons are several: they are new (these structures are a relatively recent invention), the plants are in most cases under the direct ownership of the municipality which is trying to set an example for other construction, and the districts are strictly regulated in their planning, layout and appearance.

So far standard factories have been established only in a limited number of countries. Great Britain, Holland and Denmark are the ones where this program is an accepted part of industrial development. The reason is not solely that governmental help and encouragement is available. Many other countries have similar economic and legislative situations, and favorable conditions can be created once the need is recognized. The reason for the lack of standard factories here and abroad is due to a large degree to unfamiliarity and distrust of a new building form.

England has done most in the establishment, design and utilization of this type of plants. It has reached a point where no substantial industrial district is created without providing rentable units.

Standard factories, as discussed in this paper, are unknown in the United States; they are not even theoretical considerations in urban redevelopment or industrial district schemes.

There are some isolated examples of factories for lease here. But they are custom made (as in Clearing Industrial District in Chicago) for tenants who prefer for various reasons to rent space. This practice, as well as the sale and rent-back arrangements, are purely financial manipulations which have little in common with standard factories.

Several industrial districts or cities have erected basic shed structures for rent or sale as a come-on for prospective industrial tenants. Prefabricated structural elements for industrial buildings have a long and successful history in the United States. (One example is the precast tilt-up wall construction in the International Airport Industrial District in Los Angeles.)

In larger cities workshops have long utilized partitioned space in multistory loft buildings. The extensive garment district in New York City is an example of this. (It is also an example of the atrocious conditions created when small manufacturers are forced into congested unsuitable premises.)

All these disorganized examples indicate that various elements of the standard factory idea are present in our industrial picture, but never all at the same time. Nevertheless, it gives credence to the assumption that rentable units are feasible under our economic and manufacturing conditions if the advantages are understood and exploited.

Going a step further, it could even be suggested that specialized plants should incorporate more features which would place them in the standard factory category (simple floor plan, overall distribution of utilities, uniform lighting and ventilation). With constantly advancing technology and changing processes, many efficient plants become soon obsolete, or they outgrow the premises long before the building's life is up. It is then often cheaper for manufacturers to scrap the factory and start anew. Obviously, if the structure could be sold to a new producer, the write-off would be considerably less.

The standard factories in Europe fall into three easily distinguishable categories:

First, one story sheds for manufacturing use erected as self-contained buildings or divisible with partitions in different-size units.

Second, small workshops near commercial centers to serve local residents.

Third, multistory (or flatted) plants for workshops where land is at a premium.

A. One Story Standard Factories

These buildings are usually light-framed structures with a single-floor production space and a one or two-story attached office block in front.

They fall into two distinct classes by their function and operation:

1. Structures which consist of a number of separate adjacent units or a large space which can be subdivided in smaller units.

These are called Sectional or Nursery factories in England. They are utilized by workshops or very small manufacturers. The units range in size from about 1,000 to 6,000 sq. ft. including not more than 10% office and lavatory area (this may be common for several units). The manufacturer expands by taking over additional units.

In England these factories are found in practically all except the very smallest trading estates (British for industrial districts): Slough (has 100 sectional factories), Trafford Park, Team Valley, Welwyn, Harlow, etc. Kopenhagen also has such a factory.

2. Factories which are complete buildings rented whole to a tenant.

Alterations of the structure to suit a particular process are possible but are kept to a minimum. The production space ranges from about 9,000 to 20,000 sq. ft. The manufacturers expand by moving to larger units or, when they outgrow this, by building their own plant.

These factories are found all over England (the best known are in Team Valley, Harlow, Crawley and Glasgow); Holland has several groups in Rotterdam and the Hague.

Team Valley

The Team Valley Trading Estate was established to combat the effects of the Depression in the heavy industrial region of Newcastle. Starting with 1936 factories have been built and leased in an effort to bring more diversified employment to the area.

The estate has provided standard and sectional factories from the beginning with great success. Now a good proportion of all the structures are of this type.

The standard factories are of two sizes: 9,000 and 13,000 sq. ft. It is difficult to tell them apart since they are very much alike and both are built by the same architect. As a matter of fact, all the factories in the estate are rather similar in their appearance because of strict requirements to that effect. The standard factories are the pacesetters with their emphasis on unobtrusive exterior design, identical construction systems and the ubiquitous yellow brick. This gives a pleasant unity to the district which is still agreeable and not outdated after more than twenty years.

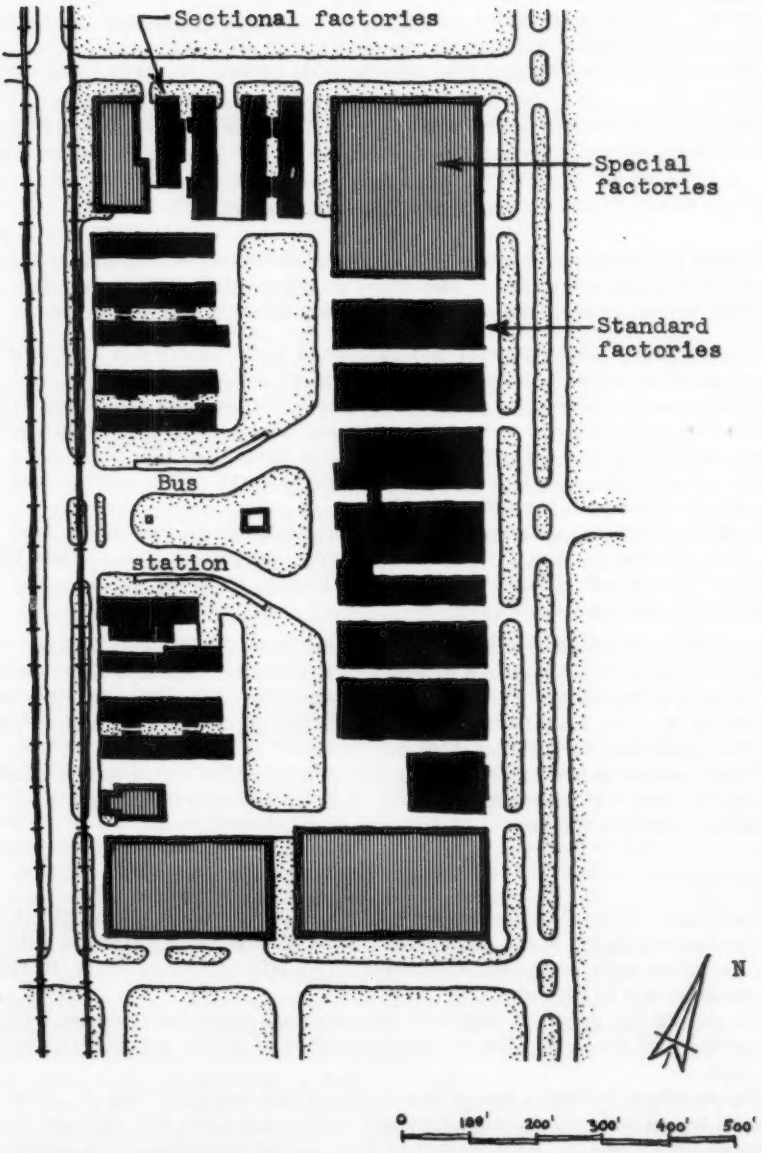


Fig.1 A BLOCK IN TEAM VALLEY ESTATE

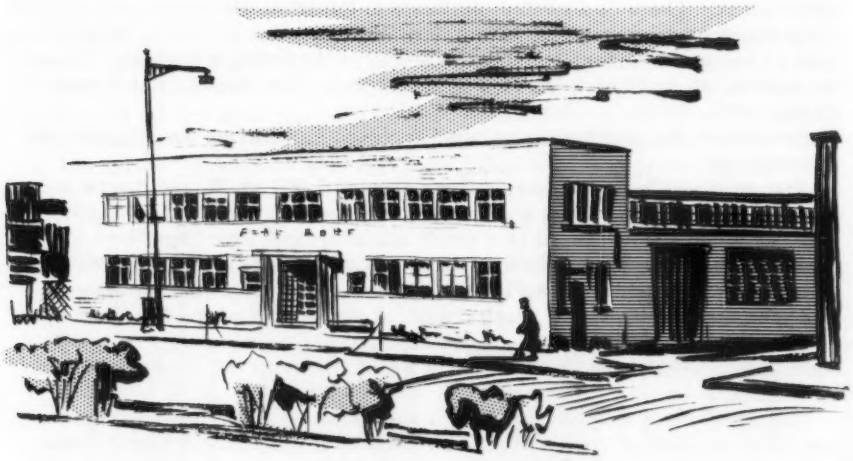


Fig.2 STANDARD FACTORY IN TEAM VALLEY

Fig.3 SECTIONAL FACTORY IN TEAM VALLEY

The floor plans for both standard factories are rectangles with a two-story office block in the front for the larger building and a single-story for the smaller. The boiler house is let into one side; the lavatories are in the office block. There is a central entrance in the front for employees; and two large truck portals on one side (see Fig. 2). The construction is steel frame with a central clerestory running the length of the building (145 ft). The center span is 30 or 50 feet; the side spans 20 feet. The building has 8 bays at 15 feet each.

Several of the structures are usually placed together on the superblocks (see Fig. 1).

The sectional factories have a floor area of 6,000 sq. ft. and can be subdivided in four parts so that a manufacturer has a choice of 1,500, 3,000, 4,500 or 6,000 sq. ft. There is a small office in front (see Fig. 3).

These buildings are grouped in pairs on each side of a service area at right angles to the road (see Fig. 1). All four of the units have access to this area through individual truck doors. A gap of 25 feet for light, air and fire protection is in the back between adjacent buildings. There is some unsightly cluttering of the service courts which indicates the need for an enclosed storage yard.

The many firms that have moved to successively larger quarters and eventually have built their own plants testify to the success of the standard and sectional factories in Team Valley.

Crawley

Crawley is one of the new British towns built to relieve the population pressures on London. It is a complete town with all services and facilities. An extensive industrial estate is incorporated in the general plan to provide local employment.

This estate contains three groups of standard factories of the same type. The first two sections were completed in 1951 and 1953. Encouraged by the results, the third section started production in 1958.

The factories of each group are arranged around a separate access and service road which branches off the main traffic artery. (The service road is often carried in a loop around the rear to serve the storage yards; other factories have only side service and storage areas.) These clusters are placed against the boundaries of the estate where their scale and volume do not conflict with the larger special factories and are more compatible with the nearby residences. The workers have convenient access from their homes.

Each individual structure contains several 5,000 sq. ft. units which are placed so that they can be rented in sizes from one half to four units. This arrangement cancels the need for separate sectional and standard factories thus simplifying the planning and building of the estate.

The basic design principles for the three groups have remained essentially the same, only the exteriors have become progressively more colorful. This is in harmony with the general character of the estate which is one of the most exhuberant new developments in Europe. Uninhibited use of colors, interesting exterior treatments, shapes and architectural details create an almost carnival atmosphere.

The more recent standard factories incorporate all the proven good features of the older groups and avoid some minor defects. Therefore the detailed discussion can be confined to this group (see Fig. 4):

The buildings are set back behind a broad lawn and large trees. The exterior design is very sensitive, especially of the main facade (see Fig. 6). Limited car parking is provided in the front with more on the rear service road.

The back storage yards are enclosed by a fence which guarantees a tidy appearance (see Fig. 7).

As in the earlier factories, reinforced concrete barrel vault construction on a 40 by 20 foot grid has been adopted for the factory space as this has been found to be satisfactory and competitive in cost (see Fig. 5).

The office blocks for these factories differ markedly from the older

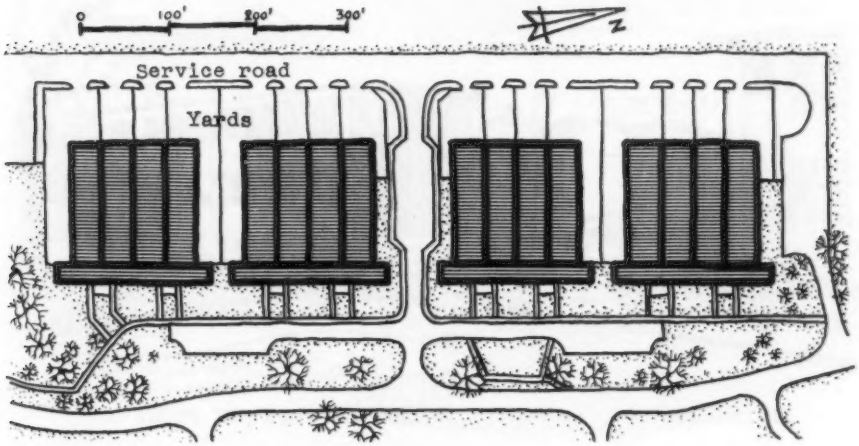
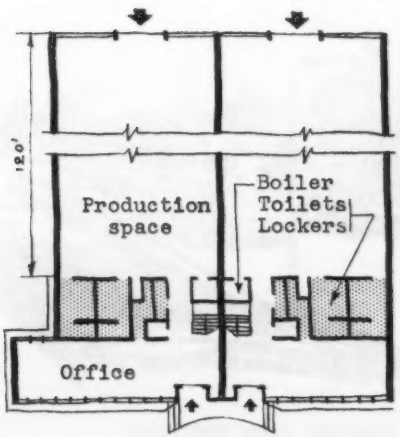


Fig.4 BLOCK OF STANDARD FACTORIES IN CRAWLEY



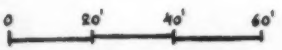
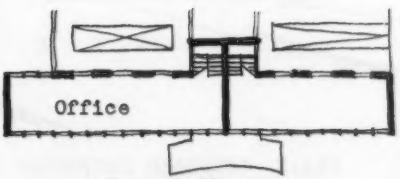


Fig.5 PLAN OF TWO UNITS IN CRAWLEY



structures. In the first group offices and lavatories were in a single-story block in front; in the second—the lavatories were moved inside the production area. For the third group, a two-floor office block is provided (1,500 to 2,000 sq. ft. for each of the four units in a structure). This space can be easily subdivided with partitions to suit individual requirements.

The space is let on a 21 year lease at an annual rent of 4/6d ($.63) to 5/- ($.70) per sq. ft.

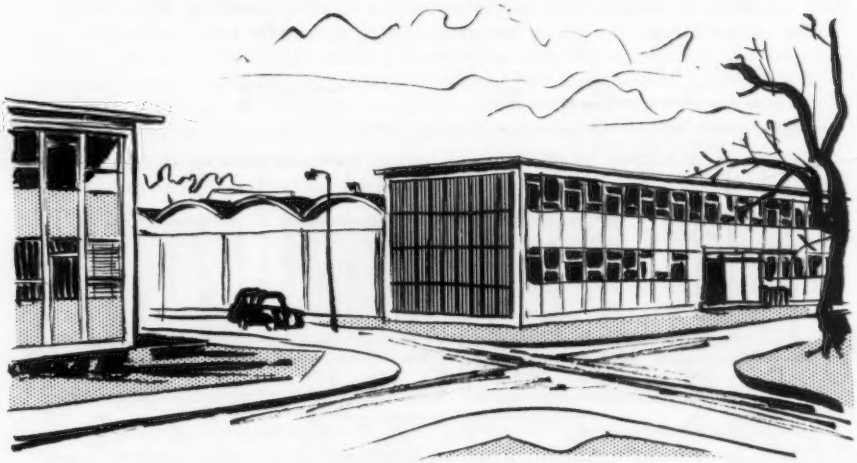


Fig.6 STANDARD FACTORIES IN CRAWLEY FROM THE FRONT

Fig.7 STANDARD FACTORIES IN CRAWLEY FROM THE REAR

Fig.8 SECTIONAL FACTORIES IN HARLOW

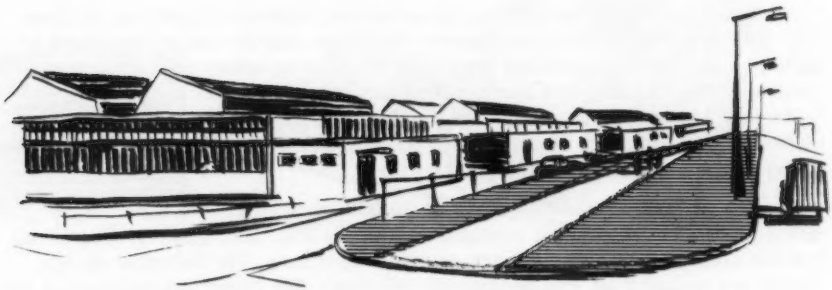


Fig.9 INTERMEDIATE FACTORIES IN HARLOW

Fig.10 STANDARD FACTORIES IN HARLOW

Harlow

The new town of Harlow is similar to Crawley in its function and planning principles. It has two industrial estates, the largest of which provides three types of standard factories.

The appearance of these estates is much more restrained than that of Crawley. The predominant building material is tan brick. The exterior designs are rather severe; only in the more recent structures glass has been introduced to any appreciable degree.

1. The smallest standard plants are sectional factories with units of 2,100 sq. ft. (see Fig. 8). These units are grouped in a contiguous row on both sides of an access road. Each individual production space extends from this access road to a rear service road. The front entrance is for workers only.

The row of gable roofs forms a sawtooth facade which is enlivened by some planting and touches of color. The repetition of these units results in a simple and functional group. The back yards are a little cluttered but they are out of sight.

2. Intermediate factories vary in size from 5,500 to 11,000 sq. ft. (see Fig. 9). The basic difference between this type and the larger standard factories is that the intermediate factories have a one-story office block and not two. The planning and construction are otherwise similar. (The sawtooth roof skylights run across the production space in the intermediate factories; the identical skylights run lengthwise in the standard—but only because of the orientation of the buildings.)

3. The standard factories of about 20,000 sq. ft. and with a two story office block are the largest rentable units (see Fig. 10). All the structures are not similar although they are grouped together. The exterior design varies appreciably—it has become more open. The basic interior layout and construction has remained unchanged (see Fig. 11).

The management of the estate feels that by providing various size units a desirable flexibility is assured for any manufacturing need. It is difficult to

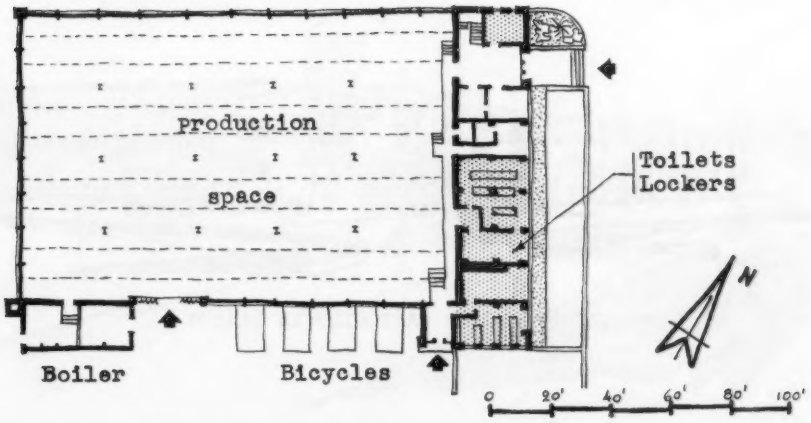


Fig.11 PLAN OF STANDARD FACTORY IN HARLOW

argue with this statement since the standard factories are certainly popular—only a few large plants are custom built. Otherwise practically all the structures in the estates are of standard sizes, but, because of intelligent grouping and variations in exterior, this fact is not immediately obvious.

The Hague

Industrialization came rather late to Holland. Because of this, and the shortage of land which requires strict governmental regulation, the

Fig.12 BLOCK PLAN OF STANDARD FACTORIES IN THE HAGUE

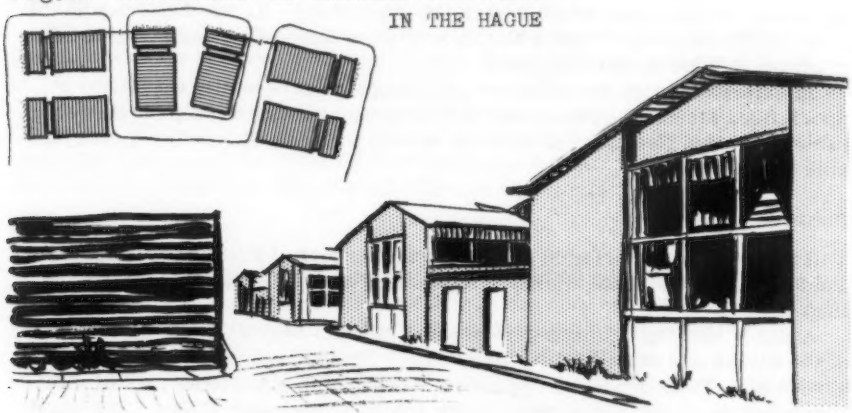


Fig.13 INTERIOR SERVICE ROAD (IN THE HAGUE)

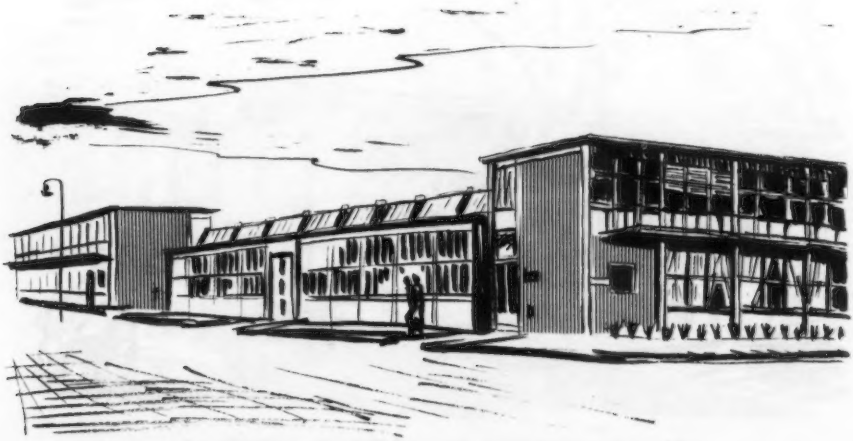


Fig.14 STANDARD FACTORIES FROM THE FRONT

industrial development has proceeded in orderly fashion. Industrial districts are well defined, designed and protected.

The City of the Hague has several industrial districts within the built-up area. They are located on municipal land and controlled as to type of manufacturing permitted and appearance of structures.

There are several groups of standard factories ranging from rather simple barrack-like sheds to elaborately designed brick buildings.

Figures 12, 13 and 14 show one of these clusters. It is a compact grouping of six structures. Each building has a two-story office block in the front. The back part consists of two separate production units (about 6,000 sq. ft. each) with a central service area between the two. The buildings are served by a loop service road which enters the superblock. Truck doors are in the sides of the buildings. The whole group is meticulously clean and shut off from the outside streets by gates.

In exterior design the buildings can compete successfully with the specialized factories some of which have received wide architectural recognition (e.g. Van Heem). The interior is well lighted and ventilated; and suitable for the tenants.

Rotterdam

The standard factories in the industrial district of Rotterdam (Spaanse Polder) follow the same approach in planning and design as the ones in the Hague.

Again it is a tight grouping on several blocks. Service yards in the center of the blocks are closed off by high walls. Trucks enter the yards from the block ends. Each production space is covered with a sawtooth roof of steel construction. A two story office block fronts on the main street. The whole structure, except for the large windows, is faced with brick. The skew walls of the front elevations break the street line (see Fig. 15).

Fig.15 STANDARD FACTORIES IN ROTTERDAM

Converted Premises

Several cities in Great Britain have established standard factories in old buildings that have been converted for this purpose.

The City of Birmingham has taken over an old tram depot and subdivided this in 10 units (ranging in size from 2,500 to 12,000 sq. ft., with one 36,500 sq. ft. unit). Regardless of the fact that the units are of various shapes, heights, floor bearing capacities and are placed atop and behind each other, the architects have succeeded in making them self-contained with individual accesses, offices, toilets and separately metered utilities. Some colorful outside panels, new paint and partitions have created an attractive manufacturing building.

The units are expressively intended for firms displaced by the city corporation's redevelopment schemes. Rents range from 3/6d ($.49) to 3/-d ($.56) per sq. ft.

The city of Liverpool took over after the war a large munitions factory of about 1,000 buildings scattered over 750 acres. This factory complex became the nucleus of the large Kirkby industrial estate. Many of the old sheds have been converted in rentable units for small manufacturers.

Kopenhagen

One of the most interesting groups of sectional factories has been completed recently in a new industrial district in the City of Kopenhagen. They are built by cooperative society for small industrialists (see Fig. 16).

The members put up initial working capital for their space at a rate of Kr. 55 per m^2 ($.75 per sq. ft.) in several installments for office and production space; Kr. 20 per m^2 ($.27 per sq. ft.) for basement. Garages cost Kr. 500 ($80). There are liberal bank loans available to meet these payments. Of course, there are also annual carrying and maintenance charges. The managers of the society admit that these costs are higher than rents for

Fig.16 STANDARD FACTORIES IN KOPENHAGEN (REAR YARD)

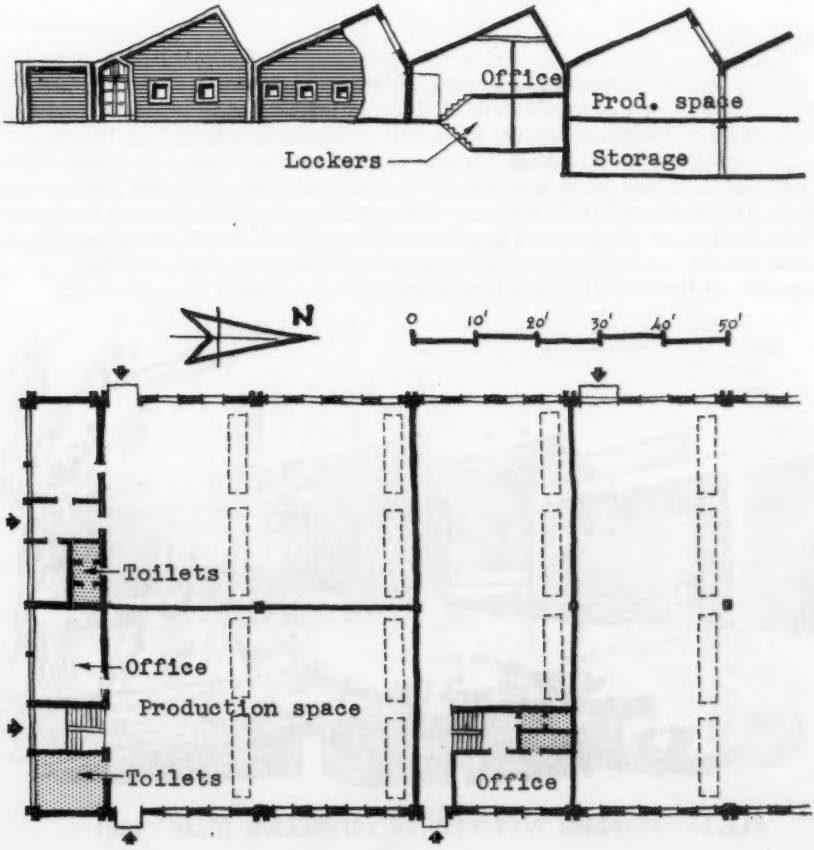
available old premises in the city, but savings accrue from communal services—from a central switchboard to central heating.

The buildings are based on bays of about 18 by 35 ft. (8 by 10.8 m). The structures are 2 bays wide (70 ft.); the length varies from about 115 ft. 197 ft. (35 m to 60 m). Full or half-story basements can be provided under a portion of the production space when requested. They are used for storage or as locker rooms. Offices and toilets can be partitioned off on the ground floor or they can be placed a half-story above the grade. In addition, some of the buildings have a one story office block in the front (see Fig. 17).

All these arrangements result in 14 possible different units ranging in size from 950 sq. ft. (88m^2) to 7,400 sq. ft. (690 m^2). Thus the prospective tenants have great freedom in selecting the size and layout of their units.

They are asked for their requirements before construction begins. This was not the case in the standard factories discussed previously. The units

Fig.17 SECTION AND PLAN OF STANDARD FACTORIES IN KOPENHAGEN



in Kopenhagen are also not rented. Whether these factors will complicate the transfer of space from one manufacturer to another remains to be seen.

The buildings are at right angles to the access road and alternate with service areas. Entrances are from both sides. Garages are grouped in separate structures; bicycle sheds are also available. The back of the lot, which abuts against a housing development, is heavily landscaped and accommodates outside tables and benches for workers' use.

The exterior design of the factories is extremely pleasing—the structure is clearly expressed by exposed white reinforced concrete framing with red brick infilling. Refined details (corner treatment, door shapes, placement of windows) are in the best tradition of Danish architecture. Even the signs and name plates follow a uniform design.

B. Workshops

There is a category of business establishments which fall somewhere between small manufacturers and detail shops. These are service industries and workshops serving local residents. They range from shoe repair to small machine shops.

The firms should preferably be located in neighborhood commercial centers where they are easily accessible to their customers. In turn, the workshops will benefit from the busy life of the shopping center. They cannot be placed among the retail stores (although they may have counter space there), since their character is not compatible with that of a shopping center. The solution is to build the workshops immediately adjacent to the center proper as structures which are similar to a sectional factory or a garage group. Service yards, truck and pedestrian access and parking must be provided.

This building type is found primarily in new developments, new towns and new shopping centers. The British new towns, Vällingby near Stockholm, the new sections of Amsterdam and other contemporary projects in Europe provide these workshops in well designed and planned groups.

Another category of similar establishments is small workshops accommodating identical trades which tend to cluster in special zones in large cities. The printing, textile, jewelry, florist, fur, etc. districts of New York and London are examples. These are firms which function more efficiently as small units, as proven by their long history, but benefit at the same time from close trade contacts. Quite often they are tied to a definite locality—available accessory services, labor supply or transportation. Since these workshops are heir to all the evils discussed at the beginning of this paper, they present problems of city planning nature which sometimes become colossal.

The solution for these same-trade workshops is either sectional factories or multi-story factories near their present location in a separate and exclusive workshop district or, if possible, in outside industrial districts. These sectional or multi-story factories would be similar to the structures discussed in detail in this paper with the exception that all the units would be custom tailored for a particular trade. The only city in Europe which is seriously considering this problem on an adequate scale in Birmingham with its Jewellery District redevelopment schemes.

British New Towns

In the British new towns, like Harlow and Crawley, service areas are set aside near each neighborhood shopping center. They are built and leased under the same conditions as the adjacent retail shops.

One of the best of these groups is in Harlow's Mark Hall center (The Stow). The buildings are clean one-story brick structures, served by parking lots, pedestrian passages from the retail center and wide vehicular roads (see Fig. 18).

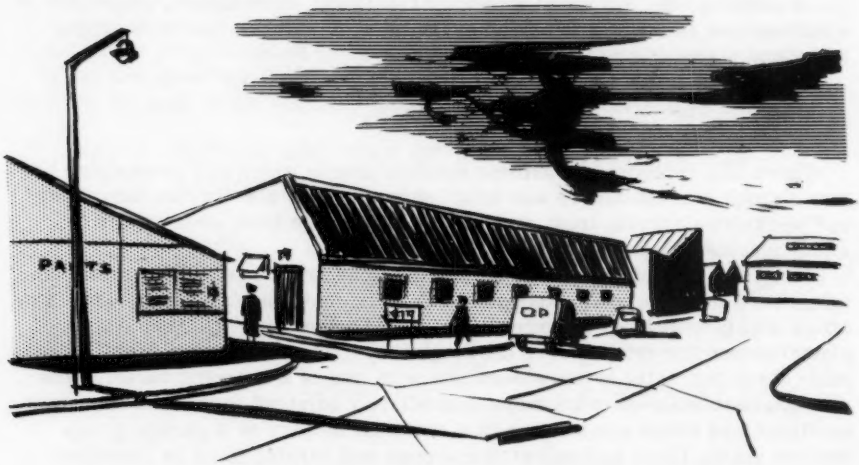


Fig.18 SERVICE INDUSTRIES IN HARLOW

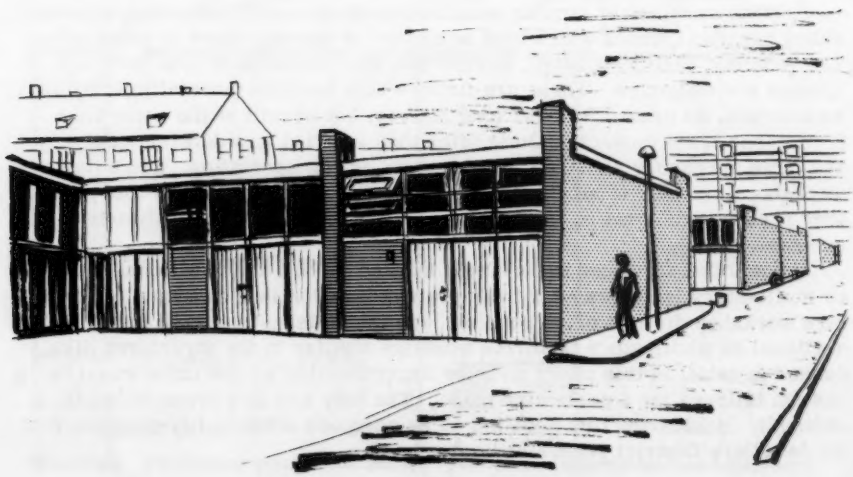


Fig.19 SERVICE INDUSTRIES IN AMSTERDAM

A minor criticism is that not enough thought is given to pedestrian customers once they are in this section. The contrast between the elaborate inside of the retail district and the frugal workshop area is too great—one is left with the impression of having walked backstage uninvited. The layout of sidewalks also unmistakably favors the car.

Amsterdam

In the new sectors of Amsterdam, west of the old city, workshops are not built as parts of commercial centers but as separate groups in the middle of residential areas.

The structures are one-story attached buildings, resembling garages, grouped around service courts or streets (see Fig. 19). Residential blocks are immediately across the peripheral street. While the architecture is attractive enough, unfortunately there is no coherence or transition between the workshops and the overpowering high apartments.

C. Flatted Factories

The term flatted, tenement or multistory factories is used in this paper to denote structures which contain rentable units' not structures used by a single manufacturer. In effect, flatted factories are sectional factories stacked one atop another. They are practical only in city centers where land is at a premium, and for manufacturers who are dependent upon the services and trade linkages found there. Multistory plants are not built in industrial districts at the present. (The original British garden towns of Letchworth and Welwyn are two exceptions.)

Obviously this building type is not suitable for industrial processes that generate much noise or vibration (the insulation required would make the costs prohibitive), use heavy machinery (heavy construction) or handle a large amount of heavy goods (vertical movement is expensive).

Flatted factories are not very popular even in Europe. Most industrial experts look suspiciously at these structures because of the current overwhelming predominance of the cheap one-story shed construction. Multistory production space is certainly more expensive in any country. Initial costs and the contingent rents are particularly critical to the small manufacturer who will occupy these premises. Nevertheless, where conditions and cost factors justify them, flatted factories have a legitimate and useful place in industrial and urban planning. Another side benefit is that these buildings lend themselves to interesting architectural solutions.

Flatted factories are found in London, Birmingham, Rotterdam and Kopenhagen.

Birmingham

The Public Works Committee of Birmingham has recently erected two flatted factories in the extensive redevelopment areas near the center of that city. These factories are intended to provide a portion of the new space required by the 1324 displaced industrial firms from the demolished areas.

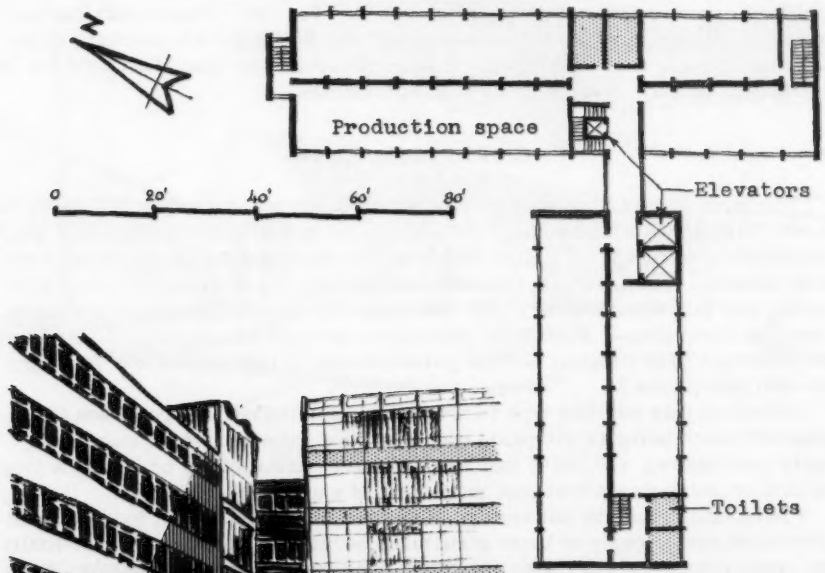
The first plant is an 8 story reinforced concrete structure. Each floor is subdivided in units ranging from 1,500 to 3,800 sq. ft. (see Fig. 20). The total rentable floor space is 117,000 sq. ft. in 46 units. The bearing capacity of the floors is 224 lbs. per sq. ft.

All services are individually metered. Toilets and washing facilities are communal on each floor.

Two goods and one passenger (this may be a little inadequate) elevators are provided. Transportation of materials between elevators and work-spaces is by hand cart.

A parking lot, which will not be sufficient for future requirements, is placed on the open area of the lot. A truck loading bay, with a tight maneuvering space, is near the goods elevators. A possible defect is the lack of a goods storage and sorting space at that location.

Fig.20 PLAN OF MULTISTORY FACTORY IN BIRMINGHAM



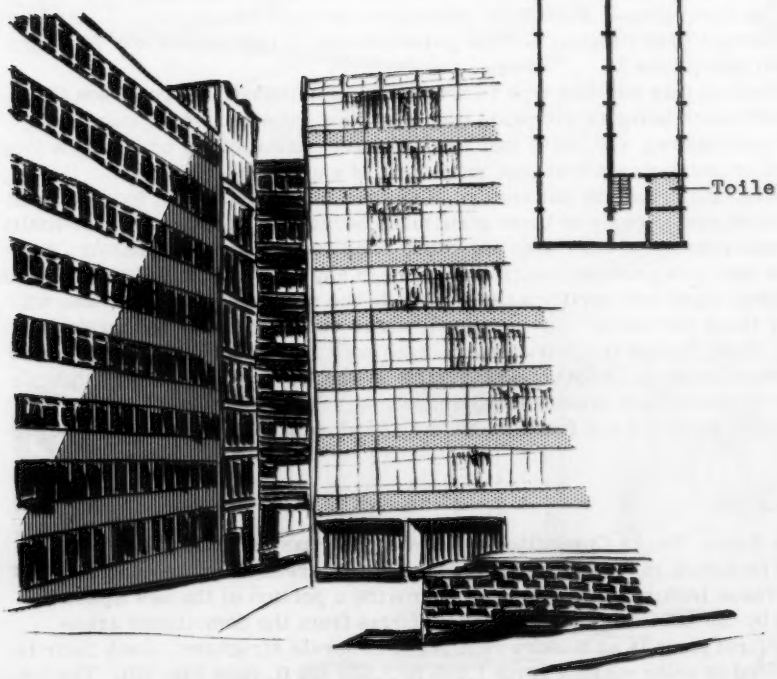


Fig.21 MULTISTORY FACTORY IN BIRMINGHAM

The exterior of the building is very cheerful—the covering materials are glass, red and yellow enameled panels and textured concrete tiles (see Fig. 21). The only questionable feature is wrought iron flowers in imitation planting boxes.

The interior is designed for easy maintenance. The large windows and relatively narrow workspaces assure adequate natural light.

No canteens or other facilities are provided since the factory is in the built-up area.

The rent (including a service charge) ranges from 5/6d ($.77) to 6/3d ($.87) per sq. ft.

The second building is 7 stories high with a total area of 71,000 sq. ft. The unit sizes are 1,000, 2,150 and 7,550 sq. ft. (the last unit is divisible in two or three parts). Otherwise the services and planning are similar to the first factory. The floor plan is not as functional.

Encouraged by the prospects of the two flatted factories, the city of Birmingham will also go ahead with the redevelopment of its famous Jewellery Quarter. At present the numerous small workshops are located in converted residences which are completely unsuitable and dilapidated. The various schemes prepared for this project all call for specialized flatted factories—small units for rent exclusively for the jewelry trade. Preliminary site plans indicate a certain shortage of landscaped open areas and parking in the development.

Rotterdam

In 1940 the center of Rotterdam was burned out completely. To provide space for the firms who had not enough capital to build new factories, a private corporation was set up with the aim of meeting a part of the demand for factory space by building rentable units.

The building was designed to be erected in five independent but adjacent vertical sections, each with an individual staircase and goods' hoist. The

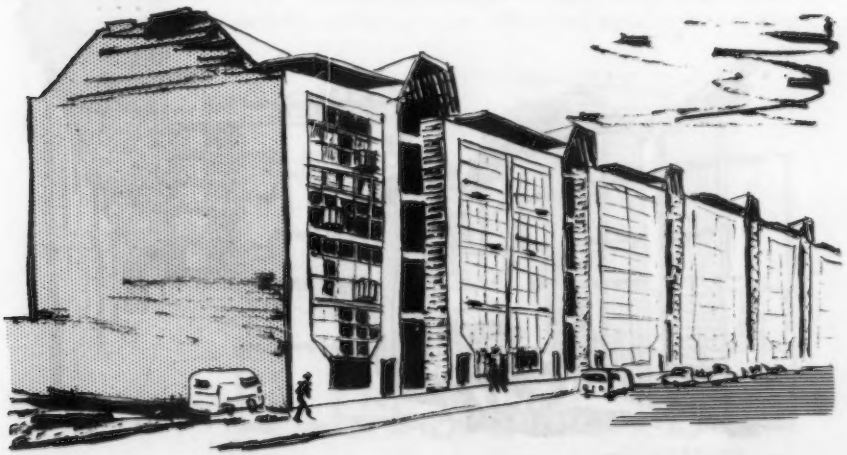


Fig.22 MULTISTORY FACTORY IN ROTTERDAM

first section was built during the war and, since the experience proved to be satisfactory, the building was completed in 1947 (see Fig. 22).

The ground floor has a single story extension in the rear. Show windows front on the main street. A bicycle storage room is located in the basement.

Each vertical section has two rentable factory units on each floor. These can be divided in two with a partition (separate entrances, utilities and toilets are provided) or they can be joined with the units in back. Each production

Fig.23 MULTISTORY FACTORY IN ROTTERDAM (FROM THE STREET)

Fig.24 MULTIST. FACTORY IN ROTTERDAM (INTERIOR SERVICE RD.)

space is about 900 sq. ft. in area. The total floor area of the building is 81,500 sq. ft.

The attic floor accommodates a cafeteria and a wide balcony with an excellent view over the harbor. The floors have a bearing capacity of 154 lbs. per sq. ft. The services and the layout does not answer the needs of contemporary practices: there are only two electric goods' hoists, the five individual staircases are wasteful, there is no off-street loading area, etc. But this was a pioneering building and, furthermore, there are no vacancies at the present.

The rents vary from f 1.10 ($.29) to f 1.35 ($.36) per sq. ft.

The exterior appearance of the structure is quite animated and interesting. It has been inspired by the old Dutch warehouses—the vertical staircases and hoist units with a canopy atop.

A second flatted factory was erected in Rotterdam when the first proved practical and profitable. This building is much more ambitious and unmistakably more efficiently designed and planned. It is a six-story U-shaped structure with a one-story shed in the middle (see Fig. 23). An interior service road solves admirably the problems of unloading materials' handling and street congestion (see Fig. 24). Storage and bicycle rooms are located in the basement. The ground floor contains shops, showrooms and an entrance lobby. The next four floors have rentable units ranging from 940 to 4,800 sq. ft. (see Fig. 25). Combinations and partitioning of units are easily possible. Especially because there is an access balcony running along the entire length of the structure at each floor in the rear. It is interesting to note that the manufacturing processes become progressively lighter on higher floors. The total floor area is more than 193,000 sq. ft. The attic provides space for cafeterias, janitors' apartments and a panoramic balcony.

Large passenger and freight elevators at good locations take care of the interior circulation.

The architectural treatment of the building has received more attention than would be strictly necessary for a factory. The exterior facade is very lively but rather pleasing. Because of similar volume, scale and outside appearance, the flatted factory blends into the office and apartment building

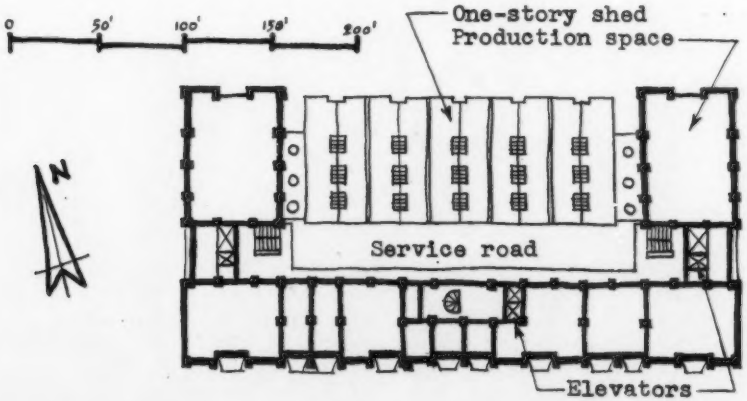


Fig.25 PLAN OF MULTIST. FACTORY IN ROTTERDAM

street. The top floor with its breezeways, roof overhangs and the communal facilities exhibits some intelligent and sensitive handling of the exposed reinforced concrete structural elements.

The rents vary from f 0.95 ($.25) to f 1.75 ($.46) per sq. ft.

Kopenhagen

Kopenhagen has several flatted factories which generally follow the previously discussed principles. One is located in the harbor area; another was built as part of a slum clearance scheme in the central city. The architecture is rather uninspired, but the buildings seem to function well. The plants have an interior loading yard with loading docks. Cafeterias are again placed on the roof to take advantage of the excellent views.

PROCEEDINGS PAPERS

The technical papers published in the past year are identified by number below. Technical-division sponsorship is indicated by an abbreviation at the end of each Paper Number, the symbols referring to: Air Transport (AT), City Planning (CP), Construction (CO), Engineering Mechanics (EM), Highway (HW), Hydraulics (HY), Irrigation and Drainage (IR), Pipeline (PL), Power (PO), Sanitary Engineering (SA), Soil Mechanics and Foundations (SM), Structural (ST), Surveying and Mapping (SU), and Waterways and Harbors (WW), divisions. Papers sponsored by the Department of Conditions of Practice are identified by the symbols (PP). For titles and order coupons, refer to the appropriate issue of "Civil Engineering." Beginning with Volume 82 (January 1956) papers were published in Journals of the various Technical Divisions. To locate papers in the Journals, the symbols after the paper number are followed by a numeral designating the issue of a particular Journal in which the paper appeared. For example, Paper 1859 is identified as 1859 (HY7) which indicates that the paper is contained in the seventh issue of the Journal of the Hydraulics Division during 1958.

VOLUME 84 (1958)

DECEMBER: 1859(HY7), 1860(IR4), 1861(IR4), 1862(IR4), 1863(SM5), 1864(SM5), 1865(ST8), 1866(ST8), 1867(ST8), 1868(PP1), 1869(PP1), 1870(PP1), 1871(PP1), 1872(PP1), 1873(WW5), 1874(WW5), 1875(WW5), 1876(WW5), 1877(CP2), 1878(ST3), 1879(ST8), 1880(HY7)[c], 1881(SM5)[c], 1882(ST8)[c], 1883(PP1)[c], 1884(WW5)[c], 1885(CP2)[c], 1886(PO6), 1887(PO6), 1888(PO6), 1889(PO6), 1890(HY7), 1891(PP1).

VOLUME 85 (1959)

JANUARY: 1892(AT1), 1893(AT1), 1894(EM1), 1895(EM1), 1896(EM1), 1897(EM1), 1898(EM1), 1899(HW1), 1900(HW1), 1901(HY1), 1902(HY1), 1903(HY1), 1904(HY1), 1905(PL1), 1906(PL1), 1907(PL1), 1908(PL1), 1909(ST1), 1910(ST1), 1911(ST1), 1912(ST1), 1913(ST1), 1914(ST1), 1915(ST1), 1916(AT1)[c], 1917(EM1)[c], 1918(HW1)[c], 1919(HY1)[c], 1920(PL1)[c], 1921(SA1)[c], 1922(ST1)[c], 1923(EM1), 1924(HW1), 1925(HW1), 1926(PL1), 1927(HW), 1928(HW1), 1929(SA1), 1930(SA1), 1931(SA1), 1932(SA1).

FEBRUARY: 1933(HY2), 1934(HY2), 1935(HY2), 1936(SM1), 1937(SM1), 1938(ST2), 1939(ST2), 1940(ST2), 1941(ST2), 1942(ST2), 1943(ST2), 1944(ST2), 1945(HY2), 1946(PO1), 1947(PO1), 1948(PO1), 1949(PO1), 1950(HY2)[c], 1951(SM1)[c], 1952(ST2)[c], 1953(PO1)[c], 1954(CO1), 1955(CO1), 1956(CO1), 1957(CO1), 1958(CO1), 1959(CO1).

MARCH: 1960(HY3), 1961(HY3), 1962(HY3), 1963(IR1), 1964(IR1), 1965(IR1), 1966(IR1), 1967(SA2), 1968(SA2), 1969(ST3), 1970(ST3), 1971(ST3), 1972(ST3), 1973(ST3), 1974(ST3), 1975(ST3), 1976(WW1), 1977(WW1), 1978(WW1), 1979(WW1), 1980(WW1), 1981(WW1), 1982(WW1), 1983(WW1), 1984(SA2), 1985(SA2)[c], 1986(IR1)[c], 1987(WW1)[c], 1988(ST3)[c], 1989(HY3)[c].

APRIL: 1990(EM2), 1991(EM2), 1992(EM2), 1993(HW2), 1994(HY4), 1995(HY4), 1996(HY4), 1997(HY4), 1998(SM2), 1999(SM2), 2000(SM2), 2001(SM2), 2002(ST4), 2003(ST4), 2004(ST4), 2005(ST4), 2006(PO2), 2007(HW2)[c], 2008(EM2)[c], 2009(ST4)[c], 2010(SM2)[c], 2011(SM2)[c], 2012(HY4)[c], 2013(PO2)[c].

MAY: 2014(AT2), 2015(AT2), 2016(AT2), 2017(HY5), 2018(HY5), 2019(HY5), 2020(HY5), 2021(HY5), 2022(HY5), 2023(PL2), 2024(PL2), 2025(PL2), 2026(PP1), 2027(PP1), 2028(PP1), 2029(PP1), 2030(SA3), 2031(SA3), 2032(SA3), 2033(SA3), 2034(ST5), 2035(ST5), 2036(ST5), 2037(ST5), 2038(PL2), 2039(PL2), 2040(AT2)[c], 2041(PL2)[c], 2042(PP1)[c], 2043(ST5)[c], 2044(SA3)[c], 2045(HY5)[c], 2046(PP1), 2047(PP1).

JUNE: 2048(CP1), 2049(CP1), 2050(CP1), 2051(CP1), 2052(CP1), 2053(CP1), 2054(CP1), 2055(CP1), 2056(HY6), 2057(HY6), 2058(HY6), 2059(IR2), 2060(IR2), 2061(PO3), 2062(SM3), 2063(SM3), 2064(SM3), 2065(ST6), 2066(WW2), 2067(WW2), 2068(WW2), 2069(WW2), 2070(WW2), 2071(WW2), 2072(CP1)[c], 2073(IR2)[c], 2074(PO3)[c], 2075(ST6)[c], 2076(HY6)[c], 2077(SM3)[c], 2078(WW2)[c].

JULY: 2079(HY7), 2080(HY7), 2081(HY7), 2082(HY7), 2083(HY7), 2084(HY7), 2085(HY7), 2086(SA4), 2087(SA4), 2088(SA4), 2089(SA4), 2090(SA4), 2091(EM3), 2092(EM3), 2093(EM3), 2094(EM3), 2095(EM3), 2096(EM3), 2097(HY7)[c], 2098(SA4)[c], 2099(EM3)[c], 2100(AT3), 2101(AT3), 2102(AT3), 2103(AT3), 2104(AT3), 2105(AT3), 2106(AT3), 2107(AT3), 2108(AT3), 2109(AT3), 2110(AT3), 2111(AT3), 2112(AT3), 2113(AT3), 2114(AT3), 2115(AT3), 2116(AT3), 2117(AT3), 2118(AT3), 2119(AT3), 2120(AT3), 2121(AT3), 2122(AT3), 2123(AT3), 2124(AT3), 2125(AT3).

AUGUST: 2126(HY8), 2127(HY8), 2128(HY8), 2129(HY8), 2130(PO4), 2131(PO4), 2132(PO4), 2133(PO4), 2134(SM4), 2135(SM4), 2136(SM4), 2137(SM4), 2138(HY8)[c], 2139(PO4)[c] 2140(SM4)[c].

SEPTEMBER: 2141(CO2), 2142(CO2), 2143(CO2), 2144(HW3), 2145(HW3), 2146(HW3), 2147(HY9), 2148(HY9), 2149(HY9), 2150(HY9), 2151(IR3), 2152(ST7)[c], 2153(IR3), 2154(IR3), 2155(IR3), 2156(IR3), 2157(IR3), 2158(IR3), 2159(IR3), 2160(IR3), 2161(SA5), 2162(SA5), 2163(ST7), 2164(ST7), 2165(SU1), 2166(SU1), 2167(WW3), 2168(WW3), 2169(WW3), 2170(WW3), 2171(WW3), 2172(WW3), 2173(WW3), 2174(WW3), 2175(WW3), 2176(WW3), 2177(WW3), 2178(CO2)[c], 2179(IR3)[c], 2180(HW3)[c], 2181(SA5)[c], 2182(HY9)[c], 2183(SU1)[c], 2184(WW3)[c], 2185(PP2)[c], 2186(ST7)[c], 2187(PP2), 2188(PP2).

OCTOBER: 2189(AT4), 2190(AT4), 2191(AT4), 2192(AT4), 2193(AT4), 2194(EM4), 2195(EM4), 2196(EM4), 2197(EM4), 2198(EM4), 2199(EM4), 2200(HY10), 2201(HY10), 2202(HY10), 2203(PL3), 2204(PL3), 2205(PL3), 2206(PO5), 2207(PO6), 2208(PO6), 2209(PO5), 2210(SM5), 2211(SM5), 2212(SM5), 2213(SM5), 2214(SM5), 2215(SM5), 2216(SM5), 2217(SM5), 2218(ST8), 2219(ST8), 2220(EM4), 2221(ST8), 2222(ST8), 2223(ST8), 2224(HY10), 2225(HY10), 2226(PO5), 2227(PO6), 2228(PO6), 2229(ST8), 2230(EM4), 2231(EM4), 2232(AT4)[c], 2233(PL3)[c], 2234(EM4)[c], 2235(HY10)[c], 2236(SM5)[c], 2237(ST8)[c], 2238(PO5)[c], 2239(ST8), 2240(PL3).

NOVEMBER: 2241(HY11), 2242(HY11), 2243(HY11), 2244(HY11), 2245(HY11), 2246(SA6), 2247(SA6), 2248(SA6), 2249(SA6), 2250(SA6), 2251(SA6), 2252(SA6), 2253(SA6), 2254(SA6), 2255(SA6), 2256(ST9), 2257(ST9), 2258(ST9), 2259(ST9), 2260(HY11), 2261(ST9)[c], 2262(ST9), 2263(HY11), 2264(ST9), 2265(HY11), 2266(SA6), 2267(SA6), 2268(SA6), 2269(HY11)[c], 2270(ST9).

DECEMBER: 2271(HY12)[c], 2272(CP2), 2273(HW4), 2274(HW4), 2275(HW4), 2276(HW4), 2277(HW4), 2278(HW4), 2279(HW4), 2280(HW4), 2281(IR4), 2282(IR4), 2283(IR4), 2284(IR4), 2285(PO6), 2286(PO6), 2287(PO6), 2288(PO6), 2289(PO6), 2290(PO6), 2291(PO6), 2292(SM6), 2293(SM6), 2294(SM6), 2295(SM6), 2296(SM6), 2297(WW4), 2298(WW4), 2299(WW4), 2300(WW4), 2301(WW4), 2302(WW4), 2303(WW4), 2304(HW4), 2305(ST10), 2306(CP2), 2307(CP2), 2308(ST10), 2309(CP2), 2310(HY12), 2311(HY12), 2312(PO6), 2313(PO6), 2314(ST10), 2315(HY12), 2316(HY12), 2317(HY12), 2318(WW4), 2319(SM6), 2320(SM6), 2321(ST10), 2322(ST10), 2323(HW4)[c], 2324(CP2)[c], 2325(SM6)[c], 2326(WW4)[c], 2327(IR4)[c], 2328(PO6)[c], 2329(ST10)[c], 2330(CP2).

c. Discussion of several papers, grouped by divisions.

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